

AUTOMOBILE

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About that Car of Yours—



If "**NORMA**" Bearings are used in the magneto and lighting generator, it indicates high quality in the car itself. Because—



"**NORMA**" Bearings are standard in the high-grade magnetos and lighting generators used on cars and trucks of the better class.

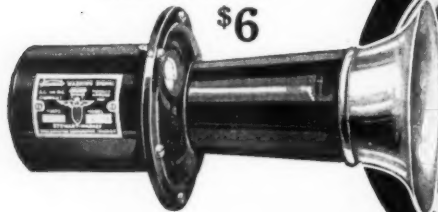


Be Sure—See that Your Electrical Accessories Are "**NORMA**"-Equipped.



Stewart
Motor Driven
Warning Signals

\$6



Stewart
Speedometer
for Fords

\$10



Stewart
Tire Pump

\$12

Stewart Products



Stewart
Speedometer

\$25

Start the New Year Right

Make 1917 your banner year! You can do it if you get started right.

Determine now to sell nothing but advertised goods—accessories of known value with a reputation and record for service. Eliminate from your line the accessories which demand so much sales effort. They cannot be profitable.

Successful retailing of automobile accessories depends entirely upon the brands you carry in stock. Accessories which have a quick turnover, and for which there is a big demand, are real money-makers. You really can't afford to handle any other.

Look about you and note the successful merchants in other lines. In nearly every case you

will find their success is due to featuring only advertised goods.

Stewart Products are leaders—a line that is standard, well-known and widely advertised. Stewart Products have a name and reputation second to none. That is why Stewart Products are the fastest-selling accessories today. This is the line you should feature and concentrate on for 1917.

Let Stewart Products help make 1917 your biggest, most profitable year. Start right now—determine to sell nothing but advertised goods—begin with a complete line of Stewart Products.

"It will pay you to see that every car is Stewart-equipped"



Stewart
Hand Operated
Warning Signal

\$3.50



Stewart
Vacuum System

\$10

Warner
Auto-Meter

\$50



Stewart
Spark Plug

\$1



The Stewart-Warner
Speedometer Corporation
Chicago, Illinois, U.S.A.

The AUTOMOBILE

VOL. XXXVI

NEW YORK—THURSDAY, JANUARY 18, 1917—CHICAGO

No. 3

Italian Fiat Absorbs U. S. A. Co.

Heaviest Stockholders in U. S. Retain Interests—Josephs, in Europe, to Return

PARIS, FRANCE (*Special Cable*), Jan. 14—The Fiat Co., of Poughkeepsie, N. Y., has been taken over by the home factory of the Fiat Co., Turin, Italy, according to information obtained in Italy a few days ago. The details of the deal are not disclosed, but it is understood that some of the heaviest stockholders in the U. S. A. Fiat factory retain their interest. J. S. Josephs, treasurer, retains his interest. Mr. Josephs is at present in Europe but sails for America in a day or so.

Allen Motor Co. to Build

FOSTORIA, OHIO, Jan. 16—The Allen Motor Co. will build a large motor car plant on a 50-acre site and will employ 1000 men. All parts of the automobile will be made here. The company has announced that additional workers will be employed later because of other factories joining the Allen company.

Hunt Joins A. O. Smith Co.

DETROIT, Jan. 16—Frank J. Hunt, purchasing agent for the Weston-Mott Co., has resigned to become the purchasing agent of the A. O. Smith Co., Milwaukee. It is reported that Fred Wade, purchasing agent for the Buick Motor Co., will take care of the purchasing department of the Weston-Mott Co. in addition to his present duties.

Metzger Heads Detroit Club

DETROIT, Jan. 17—William E. Metzger, president of the Auto Parts Mfg. Co., has been elected president of the Detroit Automobile Club; Martin L. Pulcher, vice-president and general manager of the Federal Motor Truck Co., is vice-

president; Edward N. Hines, chairman Board of County Road Commissioners, second vice-president; Sidney D. Walton, consulting engineer, third vice-president; W. B. Bachman, secretary, and J. Lee Barrett, treasurer. Directors include Martin L. Pulcher; W. A. Brush, manager Brush Engineering Assn.; R. K. Davis, sales manager Penn Spring Works; E. W. Lewis, vice-president Timken-Detroit Axle Co.; A. O. Dunk, president Puritan Machine Co.; Sidney D. Walton; William E. Metzger; M. C. DeWitt, secretary Jeffery-DeWitt, and Edward N. Hines.

Continental Offers \$3,500,000 Stock

NEW YORK, Jan. 17—The Continental Motors Corp. is today offering for subscription \$3,500,000 7 per cent cumulative preferred stock, par \$100. The new corporation, which recently acquired the entire property and business of the Continental Motors Co., has a capital of \$3,500,000 preferred, and \$14,522,580 common, par \$10. The public offering is being handled by Lee, Higginson & Co., and William P. Bonbright & Co., at 97½ and accrued dividend.

Slater Promoted by Firestone

CHICAGO, Jan. 12—W. J. Slater has been appointed special representative of the general sales department of the Firestone Tire & Rubber Co. He was formerly manager of the sales-promotion department of the company.

D. A. C. to Honor Chalmers

DETROIT, Jan. 15—Hugh Chalmers will be the guest of honor at a dinner given by members of the Detroit Athletic Club this week. The occasion marks the retirement of Mr. Chalmers from the club presidency. The invitations issued were made up in the form of a stock prospectus, "Hugh Chalmers, Inc.," etc.

Among those who will attend will be James Couzens, W. O. Briggs, Mayor Oscar B. Marx, Harry Ford, Howard Coffin and B. G. Koether.

Winton Wins Axle Suit Appeal

Court Reverses Decree of Nov. 20, 1915, in Favor of Lindsay Auto Parts Co.

CINCINNATI, Jan. 13—An opinion reversing the decree against the Winton Motor Carriage Co. in the axle suit brought by the Lindsay Motor Parts Co. has been handed down by the U. S. sixth circuit court of appeals.

The Lindsay company brought suit in the U. S. district court, Cleveland, Jan. 21, 1915, charging infringement of driving axle patent No. 748,760. Judge John H. Clarke handed down an opinion in favor of the plaintiff on Oct. 13, 1915, on the grounds that the inventor had shown evidence of the priority of his invention over similar axles, that the Lindsay axle constituted an invention, that the defendant was aware of the fact that the plaintiff had obtained patents on the invention, and other particulars.

The feature of the construction covered by the patent was that it allowed the inner or driving axles to be longitudinally removed from the tubular sections and inspected, repaired or replaced without disturbing the body of the car or dismantling the outer casings. The construction also permitted the differential to be inspected or withdrawn without dismantling any part of the car other than one-half the central section of the axle.

Decision of Lower Court

Judge Clarke handed down a decree on Nov. 20 calling for a perpetual injunction against the Winton company restraining it from making the type of axle in question. The company appealed Dec. 8, 1915, and obtained on the same date an order from Judge Clarke suspending the injunction during the appeal of the suit.

Chevrolet Prices Are Higher

490 Model Is Now \$550 and Eight Is \$1,385—Other Price Increases

FLINT, MICH., Jan. 12—The Chevrolet Motor Co. has increased the prices of its products. The 490 is now \$550, an increase of \$90; the eight-cylinder model is \$1,385, which is \$285 more than was originally planned.

Owen Magnetic Prices Increased

CLEVELAND, Jan. 12—All models of the Owen Magnetic cars were increased in price Jan. 1. The 125-in. wheelbase chassis on which is built a coupé, touring car, limousine and landaulet, has gone up \$150. The 136-in. wheelbase chassis on which is built a roadster, four and seven-passenger touring car, limousine and landaulet, has been advanced \$200.

New Selden Prices Jan. 15

ROCHESTER, N. Y., Jan. 16—Four models of Selden trucks were increased in price on Jan. 15. The 1-ton worm-drive was advanced to \$1,850 from \$1,700; the 2-ton worm-drive was raised from \$2,200 to \$2,350; the 2-ton internal-gear-drive is now priced at \$2,150, formerly \$2,000; and the 3½-ton worm-drive has gone up to \$3,150 from \$2,950. The light delivery worm-drive truck remains at \$985, and no change has been made in the price of the \$1,385 1-ton internal-gear-drive truck. A 5-ton model with price and specifications will be announced shortly.

Reeke Resigns from Nash

DETROIT, Jan. 15—Al Reeke, general manager for the Nash Motors Co., has resigned and will enter business for himself as a Nash distributor.

C. H. Vincent Is Packard Experimental Engineer

DETROIT, Jan. 12—C. H. Vincent, who was formerly associated with Ralph Mulford and E. C. Patterson, has severed his connection with the Hudson Motor Car Co. and is now an experimental engineer for the Packard Motor Car Co.

Goodyear Adds Cord Truck Tire

NEW YORK, Jan. 12—The Goodyear Tire & Rubber Co., Akron, has introduced a line of cord pneumatic truck tires for use in long hauls and interurban work. The company has for some time been making pneumatic truck tires of fabric construction which have given satisfactory mileage. The cord tires for trucks

are not specially constructed tires, but represent simply the application of this principle to tires made in the proper sizes for truck use. In the method of construction they are identical with the cord tires for passenger cars. They come in the All-Weather Black Tread, and are made in sizes 36 by 6, 38 by 7, 40 by 8 and 42 by 9, with ten to sixteen plies of cords, according to the size of the tire. The prices are a little higher than similar sizes in solid tires.

Baum Succeeds Murray as Empire Tire President

TRENTON, N. J., Jan. 13—The reorganization of the Empire Rubber & Tire Co. has been effected to increase the business and working capital. J. E. Baum, a director of the Corn Exchange Bank of New York and president of the Supplee-Biddle Hardware Co., Philadelphia, has been elected president of the new company, succeeding C. Edward Murray of this city. The new company will have preferred stock of \$1,500,000 and \$3,000,000 of common.

General Murray retains a substantial interest and remains a member of the board of directors, while one son, C. Edward Murray, Jr., is a vice-president, and his other son, J. Cornell Murray, is treasurer of the new company.

Goodyear Men to Study Rubber in India

AKRON, Jan. 12—Charles Seiberling, son of C. W. Seiberling, vice-president of the Goodyear Tire & Rubber Co., and L. G. Odell of the crude rubber department have gone to India for an extended stay and will make a study of the rubber plantations.

Hartzell Promoted by Goodyear

AKRON, Jan. 15—R. S. Hartzell, formerly manager of the Cleveland branch of the Goodyear Tire & Rubber Co., has been made manager in charge of automobile manufacturers' business for the State of Ohio. Mr. Hartzell is succeeded at Cleveland by F. N. Hammond, formerly manager at the Youngstown branch.

Fisher Buys Vacuum Brake Patent

DETROIT, Jan. 15—It is reported that R. R. Thomas, head of the Electrical Equipment Co., Los Angeles, has sold his patent for a vacuum foot brake to Carl G. Fisher, J. A. Allison and other associates of Indianapolis. The basis of the sale is that of a royalty.

Assmus Is Maxwell Export Manager

DETROIT, Jan. 12—C. O. Assmus, who has been associated with the foreign department of the Maxwell Motor Co., Inc., has been made export sales manager.

Kerosene Engine in Ingram-Hatch

New Car Also Has Friction Drive, Spring Wheels and Sectional Tires

NEW YORK, Jan. 16—The Ingram-Hatch, a new car announced by the Ingram Hatch Motor Corp., of this city, with factory at Staten Island, certainly possesses the distinction of novelty. Its brief specification includes a four-cylinder kerosene engine, an elaborate friction drive and a suspension in which spring spoke wheels are included. There are also air cushions in the wheels and the tires are sectional, made of leather steel studded. These tires are filled with a resilient substance and can be replaced in sections.

Ford to Increase Production

DETROIT, Jan. 16—The Ford Motor Co. is ordering sheet bar and forging stock for deliveries up to the middle of 1918. The orders are much larger than for any previous corresponding period. This indicates a greatly increased production schedule for the coming year. In 1916 the company produced 533,921 cars.

Nash Stockholders Re-elect Directors

BALTIMORE, MD., Jan. 11—The stockholders of the Nash Motors Co. at their annual meeting re-elected the retiring board of directors and approved the annual report. The report was not issued to the public.

Later at a directors' meeting C. W. Nash was re-elected president and the other officers were also re-elected.

Mr. Nash in his report stated that the output of the company has been increased 50 per cent.

Voorhis Heads Nash Sales

KENOSHA, WIS., Jan. 15—C. B. Voorhis will become head of the selling division of the Nash Motors Co., this city, early in February. Mr. Voorhis recently resigned from the Oakland Motor Car Co., of which he was vice-president, director and general sales manager.

Smith Promoted by Bound Brook

BOUND BROOK, N. J., Jan. 16—A. K. Smith has been appointed production manager of the Bound Brook Oil-less Bearing Co. He has been with the concern 3 years.

Blomstrom with Safety Motor Co.

GRENLOCH, N. J., Jan. 12—C. H. Blomstrom, veteran automobile builder, is now connected with the Safety Motor Co., this city. This concern is making the Frontmobile, which is driven entirely by the front wheels.

Knight Special Worm-Driven

Also Featured with Entz Magnetic Transmission and Moline Engine

NEW YORK, Jan. 11—A car in which the three features of a Knight engine, Entz magnetic transmission and worm drive are combined is being developed in this city by Watson and Stoeckle, 351 West Fifty-seventh Street. It will be called the Knight Special and the chassis will be sold at approximately \$4,000 or will be equipped with a custom body to suit the purchaser.

61-in. Cantilever Rear Springs

The engine used is the Moline-Knight four-cylinder 4 by 6. One of the other features is the rear suspension consisting of unusually long cantilevers—61 in. There are no levers visible in the drivers compartment, the gearshift of course being replaced by the Entz controller and the emergency brake being pedal-operated. The wheelbase is 132 in. Leather universals are used and Timken axles. One car has been built and plans are going forward for a moderate production this year.

Fageol Has 125 Hp. Motor and Sells for \$9,500

CHICAGO, Jan. 15—One of the most interesting cars at the Chicago show will be the Fageol, which has one of the highest priced chassis in the world, if not the very highest.

The chassis sells for \$9,500. The car will be exhibited as a four-passenger touring speedster and is equipped with a Hall-Scott six-cylinder aviation motor, rated 125-150 hp. A special custom body is now being fitted to the chassis at the shops of the C. P. Kimball Co. The motor is equipped with Bosch electric lighting, starting and ignition apparatus and with the gearset takes up about three-fourths of the length of the chassis. Connection between the gearset and the Kardo axle is by a short shaft and universal. Light weight is a distinctive feature of the car, which is different in appearance from any other on the market and is characterized by a wedge-shaped radiator and an unusually low body.

Chandler Elects Two New Directors

NEW YORK, Jan. 13—At a meeting of the directors of the Chandler Motor Car Co. held here last week, vacancies on the board caused by the resignation of James B. Bell, of Toledo, and James S. Dunstan, of this city, were filled by the election of John Sherwin, president of the First National Bank of Cleveland and

Charles A. Otis, senior member of the banking firm of Otis & Co., Cleveland.

The board as now constituted consists of F. C. Chandler, president; W. S. M. Mead, vice-president; Samuel Regar, treasurer; J. V. Whitbeck, chief engineer; J. W. Prentiss, of Hornblower & Weeks, John Sherwin, First National Bank of Cleveland and Charles A. Otis, of Otis & Co., Cleveland.

President Chandler reported that the fiscal year of 1916 just closed had been the most satisfactory one in the history of the company, that orders already booked for delivery of cars in 1917 indicated still greater prosperity for the company. He also stated that for January, 1917, shipments will show an increase of approximately 100 per cent over the same period a year ago.

Teasdale Heads Federated Motors

INDIANAPOLIS, IND., Jan. 15—The final working out of the details of the recent merger of the Empire Automobile Co. and the Pathfinder Co. is being completed in New York by Boughton & Co., who are financing the scheme. As was stated last week, the Federated Motors Co. is being formed, with W. C. Teasdale as president. W. E. Stalnaker is vice-president and W. K. Bromley secretary. The three officers were formerly of the Pathfinder company, Teasdale as president, Bromley as secretary-treasurer, and Stalnaker as sales and advertising manager.

According to plans, it will be a policy of the new company to combine as possible both the Empire and Pathfinder cars under one roof in the various cities.

Johnson Jordan Purchasing Manager

KENOSHA, WIS., Jan. 15—J. F. Johnson, assistant purchasing agent of the Nash Motors Co., and its predecessor, the Thomas J. Jeffery Co., Kenosha, Wis., has resigned to accept the position of manager of purchases of the Jordan Motor Car Co., Cleveland, Ohio.

Thomas & Thomas, Consulting Engineers

DETROIT, Jan. 16—Thomas & Thomas, consulting engineers, have opened offices in the Garfield Building, 170 Woodward Avenue. The partnership consists of W. Owen Thomas and his brother, T. R. Thomas. For 2 years W. Owen Thomas was connected with the Canadian government in charge of motor transport.

Olympian Car Production Starts

PONTIAC, MICH., Jan. 15—Production of cars by the Olympian Motors Co. has started at the Pontiac factories. The models will be shown for the first time at the Detroit automobile show Jan. 20 and at the Hotel Sherman at the time of the Chicago automobile show.

LeRoi Co. to Build Engines

Takes Over Milwaukee Machine Tool Co. Plant—A New Six Model

MILWAUKEE, WIS., Jan. 13—The LeRoi Co., incorporated under the laws of Wisconsin with a capital stock of \$350,000, has taken over the plant and the gasoline engine business established several years ago by the Milwaukee Machine Tool Co., Milwaukee, and will devote its attention exclusively to the manufacture of four and six-cylinder engines for passenger cars, light commercial cars and light tractors. The name of the new concern is the trade name of "LeRoi," adopted by the machine tool company for its engines when it first engaged in this line of production.

Officers of the LeRoi Co. are: President and general manager, Charles W. Pendock; vice-president, J. Roy Frantz; secretary and treasurer, Norman Christiansen. Mr. Pendock is a well-known British engineer and designer, who was associated with several large automobile manufacturers in England until 1910, when he came to America to join a large machine tool company at Cleveland as chief engineer and designer. Three years ago he came to Milwaukee as chief engineer, designer and general manager of the Milwaukee Machine Tool Co. He is responsible for the design of the LeRoi engine.

The company is to market a six-cylinder type in addition to the line of four-cylinder engines already manufactured. The new design is essentially a passenger car type and is 3½ by 5 in. The four-cylinder types are 3½ by 4½ in., 2½ by 4 in. and 2½ by 3½ in. Among the manufacturers who have contracted for LeRoi motors are: Denby Motor Truck Co., Detroit; Day-Elders Motors Corp., Newark, N. J.; Selden Motor Vehicle Co., Rochester, N. Y., and the New Era Engineering Co., Joliet, Ill.

The plant is located at Sixtieth Avenue and Mitchell Street, in West Allis, the big manufacturing suburb of Milwaukee. The machine tool business has been removed and consolidated with the Kearney & Trecker Co., one of the largest builders of milling machines in the United States, also located in West Allis.

Roe with Nelson

DETROIT, Jan. 15—J. G. Roe, who was connected with the Hupp Motor Car Corp., has joined E. A. Nelson and will look after sales details for the new Nelson car.

216,936 Prospects in N. W.

Farmers in Minn. in 1916
Owned 62,757 Cars—
33 1/3% Gain

MINNEAPOLIS, Jan. 16—Among the farmers of Minnesota, the Dakotas and Eastern Montana, Northern Iowa and Western Wisconsin are 216,936 who are prospects for automobile concerns. This is the estimate of *The Farmer*, St. Paul publication, which has completed its annual census of automobiles in Minnesota as of Nov. 1, 1916. It is the seventh annual census and develops that farmers of the state owned 62,757 cars, which is a gain of 16,000 in a year, or 33 1/3 per cent.

Farmers own 52 per cent of the cars in the state, and on this basis is calculated the extent of the field for future sales in Twin City automobile territory.

In the three large cities, Minneapolis, St. Paul and Duluth, are owned 30,096 cars, or one for each twenty-five persons. At this ratio, citizens of towns outside the tri-cities own 26,096 machines, or 58,192 for the cities, leaving 62,750 for the farmers. In Twin City territory are 433,873 farmers, that is in the states above mentioned.

License plates issued in Minnesota number above 130,000, but the census considered numbers 118,949 actually in hands of owners on Nov. 1.

This total is more than double the figure for 1914, which was 64,185, and over three times the registration for 1913, which was 42,664.

Hamilton Motors Co. to Organize

DETROIT, Jan. 16.—Following closely on the appointment of the receiver for the Alter Motor Car Co. comes the announcement that the Hamilton Motors Co. will be organized at Grand Haven with a capital of \$500,000. Originally, the Alter company planned to erect a large plant at Grand Haven and many Grand Haven and Muskegon citizens subscribed for Alter stock.

Guy Hamilton, who is organizing the new concern, has planned to ask stockholders of Alter stock in western Michigan to exchange for stock of the Hamilton company, on an equal exchange basis. The new concern plans to build the Hamilton four having a wheelbase of 110 in., and the six having a 115-in. wheelbase. Production is planned by Feb. 1.

Masten Is Oakland Sales Manager

NEW YORK, Jan. 15—W. H. Masten has succeeded C. B. Voorhis as general sales manager of the Oakland Motor Car Co. of Michigan, Pontiac. This an-

nouncement was made by F. W. Warner, president and general manager of the company, at a dinner given by him to Mr. Masten, Mr. Voorhis and a number of Oakland officials and distributors at the Hotel Manhattan on Jan. 11. Mr. Masten is a Canadian by birth, but has lived in the Middle West and Southwest practically all his business life. He has been in the implement business for 30 years, during the last 20 of which he has held executive positions of prominence. Mr. Masten began in the retail implement and grain business in Missouri, later being associated with Amos Whiteley & Co., Springfield, Ohio, and then joining the Moline Plow Co., with which concern he was affiliated for 23 years.

Elgin Profits \$1,000,000

CHICAGO, Jan. 12—Profits for the year amounting to approximately \$1,000,000 were reported by the secretary-treasurer of the Elgin Motor Car Corp. at the annual meeting of stockholders held in Chicago Jan. 9. The company expects to produce 7500 cars during the coming year. The following officers were unanimously re-elected by the 2500 stockholders present: Frederick L. Brown, president; C. S. Rieman, vice-president and general manager; W. G. Knoedler, secretary and treasurer. The board of directors was also re-elected.

Winters Heads Victor Battery

ROCK ISLAND, ILL., Jan. 13—At the annual meeting of the stockholders of the Victor Storage Battery Co., this city, officers for the ensuing year were elected as follows: President, B. E. Winters; vice-president, G. E. Brown; secretary, B. F. White, and treasurer, T. D. White. A recent increase in the capital stock to \$100,000, to take care of expanding business, was indorsed.

Picard Takes Stromberg in New York

NEW YORK, Jan. 12—A. J. Picard & Co., this city, accessory dealer, will on March 1 take on the Stromberg carburetor, now handled by the Stromberg Motor Devices Co., factory branch. F. E. Tucker will resume his duties as wholesale manager with the A. J. Picard company.

Hard Takes Over Superfactor

BUFFALO, N. Y., Jan. 10—The Hard Mfg. Co., this city, has taken over the Willet Superfactor, a device consisting of an auxiliary air valve system for attachment to the intake manifold, and expects to manufacture the superfactor and market it. Heretofore the superfactor has been manufactured by the Buffalo Motor Appliance Co., Buffalo, N. Y.

Exports Increase in November

6992 Cars and Trucks Shipped
Abroad—Gain Is 1749
Over 1915

WASHINGTON, D. C., Jan. 13—The outstanding features of the American automobile export trade during November last were the continued increase in the number and value of passenger cars exported, an unexpected rise in the number of commercial cars shipped abroad, and a constantly rising market for American cars in South America and Asia and Oceanic countries. The passenger cars exported in that month numbered 5337, valued at \$4,016,930, as against 3690, valued at \$2,791,507, during the corresponding month of 1915. Exports of commercial cars jumped from 1553 machines valued at \$3,837,307, in November, 1915, to 1655 cars, valued at \$5,175,114, in November last. Exports of parts, not including engines and tires, increased from \$1,693,787 to \$2,151,434 during the same periods.

While exports of commercial cars showed a substantial increase in November, they fell behind several million dollars during the 11 months' period, dropping from 20,430 cars, valued at \$55,918,770, in 1915, to 17,572 cars, valued at \$49,181,460, in 1916. On the other hand, the shipments of pleasure cars increased from 38,200, valued at \$32,334,332 to 57,036 cars, valued at \$40,066,427, during these periods, while parts exports, not including engines and tires, increased from \$14,878,647 to \$22,243,237. Some shipments by countries are:

France	862	\$3,070,209
United Kingdom	642	1,812,165
Canada	659	488,436
British East Indies	566	399,278
Argentina	386	273,883
Russia	142	264,074
Australia	312	168,572
Asia and Oceania	1,331	1,200,170

Complete Economy-Bellefontaine Merger

BELLEFONTAINE, OHIO, Jan. 16—The merging of the Economy Motor Co., Tiffin, Ohio, with the Bellefontaine Automobile Co., has been completed. The new concern will retain the name of the Economy Motor Co. and will move its factory here from Tiffin, and manufacture passenger cars. Officers elected are: President, A. J. Miller; vice-president, R. W. Miller; treasurer, F. C. Spittle; secretary, Johnson West.

New Ellis Silent Motor

DETROIT, Jan. 16—The Ellis Silent Motor Co., with which Edwin J. Ellis, inventor of the Ellis motor, is connected, will have the backing of St. Joseph, Mich., business men through its initial organization. The motor will be exhibited at Chicago.

Show Attendance 15% Greater

Record Sales of Cars and Accessories—Many New Dealers Appointed

NEW YORK, Jan. 15—New York's greatest automobile show came to an end here Saturday night after breaking all records in attendance, retail business transacted, dealers' contracts signed and general public enthusiasm in the history of the industry. It is estimated by the N. A. C. C. officials that the attendance was 15 per cent or more greater than at last year's show. The same authority is responsible for the statement that more dealers attended the show than ever before, although it has not yet been possible to complete a count. Practically every exhibitor reported increased sales as compared with the show of 1916 and all were tremendously enthusiastic over the great increase in popular interest and general readiness to purchase cars.

The show enabled many dealers to close sales that had been under negotiation for some time and furnished all of them with long lists of prospects which will keep them busy for many weeks to come.

That the show was the greatest ever held is everywhere evident. Unofficial estimates of the attendance ranged from 300,000 to 500,000, but, of course, this is merely a matter of conjecture.

The N. A. C. C. reports that the new method of handling dealers is much more successful than that formerly employed and the dealers were better satisfied.

New Exhibition Building for New York

NEW YORK, Jan. 12—This city is to have additional exhibition space, seating 40,000 according to plans which are being formulated for the construction of a large amphitheater to occupy an entire city block some place between Forty-second and Fifty-ninth Streets and Fifth and Seventh Avenues. The building is to cost between \$7,000,000 and \$8,000,000, and is expected to be finished next year.

M. & A. M. Re-Elects Stiger Pres.

NEW YORK, Jan. 15—C. W. Stiger of the Stromberg Motor Devices Co. was re-elected president of the Motor and Accessory Manufacturers at the annual meeting of the board of directors. Other officers elected were: First vice-president, Charles E. Thompson, president of the Steel Products Co., Cleveland; second vice-president, E. H. Broadwell, vice-president of the Fisk Rubber Co., Chicopee Falls; third vice-president, T. J. Wetzels, of the Precision Die

Casting Co., Syracuse; treasurer, L. M. Wainwright, president of the Diamond Chain & Mfg. Co., Indianapolis; secretary and assistant treasurer, Alfred P. Sloan, president of the United Motors Corp., New York. C. W. Stiger, James H. Foster, T. J. Wetzels and W. O. Rutherford were re-elected directors to serve for 3 years. The present board of directors includes these men and Alfred P. Sloan, T. W. Beach, Christian Girl, William C. Rands, William M. Sweet and L. M. Bradley, manager. The Rowe Calk Mfg. Co., Hartford, Conn., was elected to membership.

N. A. C. C. Men Off to Shows

NEW YORK, Jan. 15—Sam Miles, manager of the national shows, will leave for Chicago on Wednesday to superintend the Chicago show. Alfred Reeves, general manager of the National Automobile Chamber of Commerce, will leave later in the week, and from Chicago will go to San Francisco in response to the invitation of the show managers of that city that the N. A. C. C. be represented at their exhibition. While on the Coast Mr. Reeves will visit dealers in the principal cities in connection with manufacturers' co-operation.

Ten Broeck Tire Business Doubled

LOUISVILLE, KY., Jan. 13—After re-electing the officers and directors for another year, stockholders of the Ten Broeck Tyre Co., at their annual meeting, authorized the officers to install at once in the tire plant at Twenty-sixth and Courtney Streets a cotton mill plant, in which to spin yarn and weave fabrics for the company.

The company's business during 1916 was more than double that of 1915.

H. L. Lewman continues as president. Other officers are Fred Haupt, vice-president; W. N. Cox, treasurer, and W. C. Lewman, secretary and general manager. The officers, with F. E. Trumpler, constitute the board of directors.

Salon Sales Increase 100 Per Cent

NEW YORK, Jan. 12—Sales of cars at this year's Automobile Salon, which closed last night, show an increase of 100 per cent over a year ago. From the opening on Jan. 2 up to Tuesday night sales amounted to \$400,000. Sales are expected to pass the \$500,000 mark. Attendance has been 50 per cent ahead of any previous year.

Canton Auto Parts Co. Formed

CANTON, OHIO, Jan. 12—The Canton Auto Parts Co. has been formed to manufacture a piston ring, invented by Stewart Kurtz, 16 years old. The company is capitalized at \$100,000 and will employ 700 men.

Gasoline 1 to 2 Cents Higher

Advanced in Pennsylvania, Alabama, Oklahoma, Arkansas and Other States

NEW YORK, Jan. 13—Gasoline prices throughout the country are gradually being adjusted to the higher scale started 2 weeks ago by the Standard Oil Co. and the independents. This week's advances embrace such territories as Pittsburgh, Oklahoma, Alabama, Mississippi, New Mexico, Arkansas and Louisiana.

The Atlantic Refining Co. has advanced gasoline prices as follows in Pittsburgh: automobile grade, 25 cents, 68-70 deg. to 28 cents, 73-76 deg. to 32 cents a gallon. Previous prices for the three grades were 25, 27 and 29 cents, respectively.

The Texas Co. has advanced the price of gasoline 1 cent a gallon in the following States, the new prices being: Oklahoma, 22 cents; Alabama maximum, 26 cents, minimum 22½ cents; Mississippi maximum 23½ cents, minimum 21½ cents. Kerosene has been advanced ½ cent a gallon in New Mexico. This company has advanced prices in Arkansas and Louisiana 2½ cents a gallon. The maximum and minimum prices there now are: Arkansas, 23½ and 23; Louisiana, 23 and 21 cents.

Gasoline has been advanced 1 cent in New Jersey and 2 cents per gallon in Delaware and Pennsylvania. The tank wagon basis in New Jersey is now 21 cents, while in the other two States it is 23 cents. It is stated that indications point toward an increase in the Metropolitan district within the next week, owing to the increase in the price of crude oil.

The Standard Oil Co. of Indiana has advanced gasoline ½ cent a gallon to 19 cents, tank wagon basis, in its entire territory. Kansas City prices have been advanced 1 cent a gallon to 18.8 cents, tank wagon basis, a record price for this city.

To Protect Pullman Assets

YORK, PA., Jan. 12—William A. Keyworth, Carlton L. Hoff and Henry D. Schmidt, all of York, Pa., were appointed receivers for the assets in all parts of the United States of the Pullman Motor Car Co., in the United States District Court at Williamsport yesterday.

Tracy Succeeds McDearmond with Oakland

PONTIAC, MICH., Jan. 13—W. R. Tracy has become assistant sales manager of the Oakland Motor Car Co., this city. He succeeds Thomas H. McDearmond, who has joined the George P. Miller Co., Oakland dealer in Madison, Wis.

Munitions Co. To Build Engines

**Amalgamated Machine Corp.,
Ammunition Machine Maker,
Overhead-Valve Design**

CHICAGO, ILL., Jan. 15—The Amalgamated Machine Corp., this city, is turning its plant partly over to the production of engines and will have a new type of overhead-valve engine at the show. This company is one of the largest makers of machines for producing ammunition.

Cadwallader Elected Seneca Pres.

FOSTORIA, OHIO, Jan. 11—At a meeting to-day of the Seneca Motor Car Co., formerly the Fostoria Light Car Co., Ira Cadwallader was elected president, Charles Ash vice-president and J. H. Jones secretary-treasurer, with Alexander Kiskadden of Tiffin, P. H. Brown of Toledo and C. D. Whitelaw of Findlay, as directors.

Elliott and Johnston with Smith

CHICAGO, Jan. 16—Eugene Elliott has been appointed general eastern sales manager of the Smith Form-A-Truck Co. and A. F. Johnston has been made general western sales manager. Mr. Elliott was formerly production manager for the Haynes Automobile Co., Kokomo, Ind.; and Mr. Johnston was sales manager of the Automatic Carburetor Co.

A new plan of distribution has been completed by the company. All the territory is to be divided into a number of major blocks, each under a manager with sub-division under from four to eight factory representatives and service managers.

Jenkins Heads Four Drive Tractor

DETROIT, Jan. 15—The Four Drive Tractor Co. held its annual meeting last week and elected E. J. Jenkins, R. Fitch, Dr. W. H. Taylor, G. Fitch, J. C. Jenkins and A. Johnson as directors. Officers elected were E. J. Jenkins, president; J. Allen, vice-president; A. Johnson, secretary and treasurer. The company plans to manufacture tractors at once.

Tire Companies Complain of Discrimination in Freight Rates

WASHINGTON, D. C., Jan. 16—The McGraw Tire & Rubber Co., East Palestine, Ohio, has filed with the Interstate Commerce Commission a complaint against the Pennsylvania Co., and about twenty other railroad companies in which it is alleged that rates charged under Southern Classification tariffs effective July 10, 1916, and in previous issues, on rubber tires are excessive, unfair, and discriminatory.

The complaint recites that these rates apply to pneumatic rubber tires, to rubber pneumatic inner tubes, and solid rubber tires, mounted. It also recites that higher rates are charged under the classification in question on articles mentioned from East Palestine to Jacksonville and Atlanta, than to Havana, Cuba, via Atlanta, Jacksonville or Key West.

An investigation by the commission, with relief, is asked. The Kelly-Springfield Tire Co., Akron, Ohio, also has filed complaint with the Commerce Commission protesting against rates charged on rubber tires from either Akron, or Cumberland, Md., for southern destinations, in either mixed or straight shipments. Relief and reparation are asked, and the commission also is requested to fix rates in maxima on such shipments from Akron and Cumberland to the southern classification points.

Chamber of Commerce to Discuss Industrial Relations

WASHINGTON, D. C., Jan. 13—National defense will be discussed at the fifth annual meeting of the Chamber of Commerce of the United States, 2 weeks hence. Among the speakers will be Howard E. Coffin of the Naval Consulting Board, and Maj.-Gen. Leonard A. Wood.

Chamber of Commerce to Discuss Industrial Relations

Another entire session will be devoted to the subject of industrial relations and still another to conditions after the war, divided into four aspects: Business conditions, financial conditions, transportation and education for foreign trade.

The secretary of commerce will speak on trade preparations after the war: W. D. Simmons, president of the Simmons Hardware Co., on education for foreign trade and others will discuss subjects in this section.

The sessions will begin Jan. 31 and end Feb. 2.

Acme Tire Prices Higher

TRENTON, Jan. 15—The Acme Rubber Mfg. Co., this city, has raised its tire prices from 15 to 20 per cent, effective to-day. The 30 by 3½, formerly \$16.50, is \$19; the 32 by 4 has been increased from \$23.90 to \$27.50; and the 36 by 4½ from \$32.60 to \$42.30. The tube prices have also been affected by a proportionate increase. The 30 by 3½ size has been increased from \$4.10 to \$4.50; the 32 by 4, \$5.30 to \$5.80; and the 36 by 4½, \$7.30 to \$8.

Fletcher Leaves National Machine

DETROIT, Jan. 15—M. B. Fletcher, general manager of the National Machine Products Co., has resigned and will announce his new appointment in the near future.

U. S. Rubber Co. Refinancing

**\$60,000,000 Bonds Bought by
Kuhn, Loeb & Co. for
Larger Working Capital**

NEW YORK, Jan. 13—Negotiations have been completed covering the purchase of \$60,000,000 first and refunding mortgage 5 per cent bonds of the United States Rubber Co., to cover all existing bonds and liens upon the properties of the company and to provide larger working capital. By the new financial arrangement, Kuhn, Loeb & Co. have begun the formation of a syndicate to underwrite the issue. With them will be associated the American International Corp.

W. S. Kies, vice-president of the American International Corp.; C. B. Seger, vice-president of the Union Pacific Railroad Co., and J. S. Alexander, president of the National Bank of Commerce, New York, will be elected directors of the company. Mr. Seger and Alexander, it is understood, will represent Kuhn, Loeb & Co.'s interests. The three men will be added to the board and will not succeed present directors.

Part of the proceeds from the sale of the bonds will be used to retire \$24,697,148 of obligations outstanding of the parent company and subsidiaries. All the existing obligations will be paid on or before Dec. 1, 1918, except \$2,600,000 6 per cent gold bonds of the Canadian Consolidated Rubber Co., maturing in 1946, and \$9,000,000 debentures of the General Rubber Co., due Dec. 1, 1918. The latter will be left undisturbed for the present, as the company has under consideration other plans for dealing with its crude rubber interests.

The company is not to pay any dividend on the common stock other than a dividend in common stock, unless unencumbered quick assets of the company and subsidiaries after deducting therefrom such dividends shall then exceed the aggregate debt of the company and subsidiaries, including outstanding bonds.

Last year's sales of the company and its subsidiaries are estimated at \$125,000,000, a new record. Net earnings for 1916 are estimated at \$12,500,000, a new high mark, as compared with \$11,539,313 for 1915.

Quick assets of the company over and above all liabilities, after applying the proceeds of the new bond issue, it is stated, would be \$81,363,402, and total funded debt, including the new \$60,000,000 issue only \$71,600,000, thus leaving an excess of assets of \$10,000,000. The 1916 earnings applicable to the common

stock were nearly double the highest rate of dividends ever paid on the stock, which was 6 per cent.

It is understood that the bonds will be offered for public subscription at 97.

Globe Motor Truck Co. Formed

ST. LOUIS, Mo., Jan. 15—The Globe Motor Truck Co. has been organized here and will be incorporated this week with a capital of \$200,000. The following, all St. Louis men, were elected directors: J. F. Hines, chairman, Christopher Brockmeyer, Jr., W. H. Corcoran, Louis Fusz, D. A. Marks, W. C. Mieher and G. E. Raithel. J. H. Eddy and F. N. Woodward of the Globe Motor Truck Co., Detroit, with a plant at Northville, a suburb of that city, attended the organization. The local company has taken over the plant of the National Iron Works and will begin manufacture early in February.

Rubber Club Re-elects Officers and Executives

NEW YORK, Jan. 13—The Rubber Club of America re-elected its officers and executives at its annual meeting this week. The name of the club was changed to that of the Rubber Assn. of America.

The officers are as follows: President, H. S. Firestone, president of the Firestone Tire & Rubber Co.; Van H. Cartmell, of the Kelly-Springfield Tire Co.; H. S. Hotchkiss, of the U. S. Rubber Co., and H. S. Vorhis, sec.-treas.

The executive committee is composed of the following: H. S. Firestone, chairman; G. B. Hodgman, of the Hodgman Rubber Co.; Van H. Cartmell, H. S. Hotchkiss, W. E. Bruyn, of L. Littlejohn Co., New York, and P. W. Litchfield, of the Goodyear Tire & Rubber Co.

The directors are as follows: W. E. Bruyn, Van H. Cartmell, H. S. Firestone, H. S. Hotchkiss, W. J. Kelly, of Arnold & Zeiff, New York; P. W. Litchfield, J. S. Lowman, of the Philadelphia Rubber Works Co., Akron; W. Rutherford, B. F. Goodrich Co., C. T. Wilson, of C. T. Wilson Co., New York; Tracy Lewis, of Beacon Falls Rubber Shoe Co., Beacon Falls, Conn.; J. A. Lambert, of Acme Rubber Mfg. Co., Trenton, N. J., and C. A. Daniel, of the Quaker City Rubber Co., Philadelphia.

No Substitution of Trucks for Mail Tubes

WASHINGTON, D. C., Jan. 15—The House of Representatives has defeated the recommendation of the Postmaster General and the House post-office committee that delivery of mail by pneumatic tubes in Boston, Chicago, St. Louis and Philadelphia be entirely eliminated, and materially curtailed in New York City, and that the use of motor trucks for delivery purposes be substituted for the tubes.

Fiat To Ship Two Racers

To Compete in Indianapolis Meet May 30—Have Been Under Test for a Year

PARIS, Jan. 14—*Special Cable*—The decision of the Fiat company of Turin, Italy, to enter two Fiat racing cars at the Indianapolis meet Decoration Day, May 30, this year, is conclusive proof that European countries have not lost interest in the automobile industry in America and that they are anxious to maintain their former prestige in America. It has been known for some time that Fiat has been developing new racing cars and that these have been under test for the past year. They have been given severe usage for months, the Fiat pursuing its former policy of severe testing.

It is known here that other concerns are much interested in the American speedway racing circuit but that war conditions have made it impossible for them to build special cars. The details of the new Fiats are not yet available.

Hearn Reinstated by Contest Board

NEW YORK, Jan. 15—Eddie Hearn was reinstated by the Contest Board of the American Automobile Association at its meeting last Wednesday. His reinstatement becomes effective July 12, providing he does not compete in any outlaw races up to that time. Hearn will drive two cars this year.

Disbrow Builds Two Racers

NEW YORK, Jan. 13—Louis Disbrow is making a display in this city of two new racing cars built by him and which he will use on the tracks this year. Two T-head Wisconsin engines of 60 and 90 hp., respectively, are used.

May Run Vanderbilt Race on Long Island Course

NEW YORK, Jan. 16—The Vanderbilt Cup race may be brought back to the East. A committee has been appointed to consider ways and means of bringing this about, and if it can be satisfactorily arranged the race may again be run over a Long Island course. The matter first came up for discussion at a luncheon tendered to Dr. H. M. Rowe, president of the American Automobile Assn., by Robert Lee Morrell, president of the Metropolitan Consulate of the A.A.A. Later a committee was appointed to consider the possibility of bringing the race East and to make individual investigations concerning conditions which have made it necessary that the race be held on the Pacific Coast. The committee

consists of Robert Lee Morrell, Jefferson De Mont Thompson and William Schimpf, all ex-chairmen of the Contest Board; Richard Kennerdell, present chairman, Frank G. Webb and Robert Graves. To date little progress has been made, though it is confidently expected that with the active co-operation of dealers and factories something of a definite nature may be done in the near future. The committee is to meet again in the course of a week or 10 days.

American Speedways Assn. Re-Elects Officers

NEW YORK, Jan. 14—The American Speedways Assn., at its meeting in this city last week, re-elected its officers for the coming year. A meeting will be held Feb. 1 in Chicago at which all business matters will be discussed. The officers of the association are as follows: president, Harry Harkness, New York Speedway; vice-president, Allison, Indianapolis Speedway; treasurer, H. S. Lehman, Cincinnati Speedway; and secretary, T. E. Meyers, Indianapolis.

Mulford Leaves Hudson

DETROIT, Jan. 15—Ralph Mulford has resigned from the Hudson Motor Car Co., this city. He is at present negotiating with a Cleveland automobile company. Mulford drove Hudson cars in the prominent speedway events last year and competed in the Pike's Peak hillclimb. He also set up several new records on the speedway.

Studebaker Buys Staver Plant

DETROIT, Jan. 15—The Studebaker Corp. has completed the purchase of the Staver Carriage Co. plant in Chicago, and will use it for assembling automobiles. This plant covers the block between West Seventy-sixth and West Seventy-seventh Streets, between the Rock Island Lines on the east and the Chicago Belt Lines on the west. The buildings are four stories and contain approximately 300,000 sq. ft. of floor-space.

Parker Rust-Proof Buys Patents

DETROIT, Jan. 17—The Parker Rust-Proof Co. of America, this city, has completed negotiations for the purchase of the Thomas Watt Coslett, Coslettizing patents, Nos. 870,937 and 1,007,069 and all other improvements, which may hereafter be made in rust-proofing by Mr. Coslett. This company also owns five other patents covering the rust-proofing art, as follows: Richards, No. 1,069,903, dated Aug. 12, 1913; Allen, No. 1,206,075, Nov. 28, 1916; Allen, No. 1,167,966, Jan. 11, 1916; Parker, No. 1,185,343, May 30, 1916; and Parker, No. 1,211,218 Jan. 2, 1917.

sales agent. Harry Field, owner of the New York sales company, has sold it to the Lee company and will himself remain with the local company in general charge of sales of the new department.

Mitchell-Lewis Redeems Bonds

DETROIT, Jan. 15—All of the outstanding bonds of the Mitchell-Lewis Motor Co., Racine, Wis., have been called for payment at 102 and interest, by S. W. Straus & Co. The bonds, secured by a first mortgage on the land, buildings and equipment, were dated Aug. 1, 1914. The first serial payment of \$50,000 was made Aug. 1, 1915, and the second of \$75,000 was made Aug. 1, 1916. The amount of \$175,000 is outstanding.

Amazon Names New Official Board

AKRON, OHIO, Jan. 13—Stockholders of the Amazon Tire & Rubber Co. elected the following directors at their annual meeting: L. J. Schott, L. F. Smith, C. E. Bettler and Dr. F. B. Richards of Akron and Albert Kroehle of Cleveland. The directors named these officers: L. J. Schott, president and secretary; L. F. Smith, vice-president, and C. E. Bettler, treasurer.

Western Carburetor Co. Incorporated

LANSING, MICH., Jan. 12—The Western Carburetor Co. of Alma, Mich., has been incorporated for \$100,000.

Dividends Declared

Nash Motor Co., quarterly of 1¼ per cent on preferred, payable Feb. 1 to holders of record Jan. 20.

Break in Automobile Securities

Bears Attack General Motors and Other Stocks—U. S. Rubber a Feature

NEW YORK, Jan. 17—Although the automobile stock market showed a fractional recovery yesterday from the previous depression, the market as a whole is not anywhere near as big as it was before the peace scare was announced. This week, in the face of the statement that sales of automobiles were running far ahead of last year, automobile issues found little market. General Motors dropped 14 points on three successive days, showing a net decline of 50 points to 500, the quotation on the old stock and to 103 on the new stock, which is equal to 515 on the old stock.

Profit-taking has been behind the recent decline of most of the automobile stocks. General Motors, however, has been up to this time immune from bear attacks, but with the disappointing declaration of a \$1 quarterly dividend, the stock has gradually come down in price. It would seem that dividends rather than earning power were dictating the market price of the stock.

United States Rubber prices were affected in the same way as General Motors. On the announcement of the new bond issue the common dropped 6 points from the previous close, the drop being ascribed in some quarters to the provision in the agreement with the bank-

ers that the company shall not pay any dividend on common stock, unless unincumbered quick assets of the company and subsidiaries, after deducting therefrom such dividend, shall then exceed the aggregate debt of the company and subsidiaries, including outstanding bonds.

Chevrolet Motors, which once sold at 290, touched par on Monday. The next day it pulled up to 102, and closed at a net loss for the week of 22 points.

National Rubber Stock Offering

POTTSTOWN, PA., Jan. 13—The National Rubber Co., this city, is offering its common stock for investment. The stock is being sold at \$12.50 a share, now drawing 8 per cent. It is full profit sharing, carrying voting power and is non-assessable.

This company has been in existence 4 years and has grown in that time nearly 1000 per cent. It has a new five-story cement, steel and glass factory, of which two floors are completed and in operation.

Kent Stock for Subscription

NEW YORK, Jan. 13—The Kent Motors Corp., this city, is offering 25,000 shares of stock for subscription at \$6.50 per share. The capital stock of the company is 200,000 shares full paid and non-assessable, par value \$10 each. Nagel & Simpson, 1270 Broadway, are managers of the underwriting syndicate.

This company has invested over \$232,000, having purchased 16½ acres of ground at Bellville, N. J., valued at \$85,000, and is at present building its plant, which will cost about \$300,000.

Automobile Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
Ajax Rubber Co.	70	72	..
J. I. Case T. M. Co. pfd.	86½	89	..
Chalmers Motor Co. com.	30	34	..
Chalmers Motor Co. pfd.	97½	98½	-3
*Chandler Motor Car Co.	102	106	-22
Chevrolet Motor Co.	37½	40	..
Fisher Body Corp.	80	85	+5
Fisk Rubber Co. com.	110	115	..
Fisk Rubber Co. 1st pfd.	90	100	..
Fisk Rubber Co. 2d pfd.	148	151	..
Firestone Tire & Rubber Co. com.	106	107	..
Firestone Tire & Rubber Co. pfd.	500	800	-50
*General Motors Co. com.	119	123	-1
*General Motors Co. pfd.	55½	55½	-2½
*B. F. Goodrich Co. com.	..	111	..
*B. F. Goodrich Co. pfd.	280	284	+2
Goodyear Tire & Rubber Co. com.	107½	108	+¼
Goodyear Tire & Rubber Co. pfd.	5	8	-1
Grant Motor Car Corp.	3	4	..
Hupp Motor Car Corp. com.	..	..	..
Hupp Motor Car Corp. pfd.	16	18	..
International Motor Co. com.	..	..	..
International Motor Co. pfd.	57	60	-3½
*Kelly-Springfield Tire Co. com.	90	95	-2
*Kelly-Springfield Tire Co. 1st pfd.	23	24	..
*Lee Rubber & Tire Corp.	53½	53½	+2½
*Maxwell Motor Co. com.	71	72	+½
*Maxwell Motor Co. 1st pfd.	36	37	-1
*Maxwell Motor Co. 2d pfd.	247	251	..
Miller Rubber Co. com.	106	107	..
Miller Rubber Co. pfd.	165	173	..
Packard Motor Car Co. com.	101½	..	+½
Packard Motor Car Co. pfd.	40	40½	+½
Paige-Detroit Motor Car Co.	16	18	..
Peerless Truck & Motor Corp.	168	172	..
Portage Rubber Co. com.	..	..	..
Portage Rubber Co. pfd.	26	..	..
Regal Motor Car Co. pfd.	37½	39½	-1
Reo Motor Car Co.	64	66	-1½
Saxon Motor Car Corp.	75	90	..
Springfield Body Corp. com.	110	120	..
Springfield Body Corp. pfd.	..	..	..

	Bid	Asked	Net Ch'ge
Standard Motor Construction Co.	5½	6½	+½
Stewart-Warner Speed, Corp. com.	99½	100	+½
*Studebaker Corp. com.	104½	105½	..
*Studebaker Corp. pfd.	108½	109½	+1½
Swinehart Tire & Rubber Co.	78	83	..
United Motors Corp.	41½	42½	-3¼
*U. S. Rubber Co. com.	59½	59½	-3½
*U. S. Rubber Co. pfd.	109	110	-3½
White Motor Co.	49	49½	+¼
*Willys-Overland Co. com.	35¾	36	-1½
*Willys-Overland Co. pfd.	96½	97	..

*At close Jan. 15, 1917. Listed New York Stock Exchange.

OFFICIAL QUOTATIONS ON THE DETROIT STOCK EXCHANGE ACTIVE STOCKS

	Bid	Asked	Net Ch'ge
Auto Body Co.	44½	46½	..
Chalmers Motor Co. com.	..	125	..
Chalmers Motor Co. pfd.	..	..	..
Continental Motor Co. com.	39½	39½	-2¼
Continental Motor Co. pfd.	9½	..	..
Ford Motor Co. of Canada.	250	270	-12
General Motors Co. com.	..	..	..
General Motors Co. pfd.	..	..	..
Maxwell Motor Co. com.	50	52½	..
Maxwell Motor Co. 1st pfd.	..	..	..
Maxwell Motor Co. 2d pfd.	..	..	..
Packard Motor Car Co. com.	..	169	..
Packard Motor Car Co. pfd.	101	103	-½
Paige-Detroit Motor Car Co.	39½	40½	-¾
W. K. Prudden Co.	49½	50	-½
Reo Motor Car Co.	37	37½	-¾
Studebaker Corp. com.	103	106	-2
Studebaker Corp. pfd.	..	..	..
C. M. Hall Lamp Co.	30	33	..

INACTIVE STOCKS

	Bid	Asked	Net Ch'ge
Atlas Drop Forge Co.	35½	38½	+1½
Kelsey Wheel Co.	50	..	..
Regal Motor Car Co. pfd.	27	..	..

Three buildings have already been completed, namely, the body plant, the machinery and the assembling plants. The fourth, a metal working plant, is now in course of construction. The company has material and merchandise on hand and paid for valued at \$80,000. The value of the machinery and tools installed and producing is \$27,000.

The company, it is stated, has orders on hand and applications for 60,000 cars at a factory profit of \$95 per car, which means an estimated profit of \$1,425,000 for the first year's business. A profit of over 75 per cent on its entire \$2,000,000 capital.

Trucks on Exhibition During Show

NEW YORK, Jan. 15—Several motor truck exhibits were maintained in New York last week, as no trucks were admitted to the national automobile show. Four years ago motor truck shows were discontinued on the grounds that they did not pay, but this year a number of truck manufacturers and makers of converters rented exhibition space in hotels and vacant stores.

The Hurlburt Motor Truck Co. of New York showed its 3½- and 5-ton chassis at quarters in the Hotel Biltmore. The Maxwell company exhibited its 1-tonner at this hotel. The Fulton Motor Truck Co., Farmingdale, N. Y., had its new 1½-tonner on view in one of the parlors of the Waldorf-Astoria. The Autocar had space at the Martinique. The Hudson had quarters in the Long Beach Building on Lexington Avenue across from the Grand Central Palace. A number of salesmen represented adapters attached to Fords and Rush and Vim light trucks stationed on the street outside the show quarters.

Will Fight New York Truck Legislation

NEW YORK, Jan. 16—The Automobile Trade Assn. of New York State at its annual meeting on Jan. 11 at the Engineers' Club tentatively agreed to exert its influence against the motor truck fee bill, which would greatly increase registration fees on commercial vehicles.

E. M. Alling was elected president of the association. He is president of the Automobile Dealers' Assn., Rochester, N. Y. Other officers elected were: Vice-president, E. V. Stratton, president of the Albany Automobile Dealers' Assn.; treasurer, E. G. Oliver, Hudson-Oliver Co., Buffalo, and secretary and general manager, Charles A. Stewart.

Collins Resigns from Stromberg

CHICAGO, Jan. 17—C. R. Collins, advertising manager of the Stromberg Carbu-reter Co. of America, has resigned to become advertising manager of the Racine Rubber Co., Racine, Wis., effective Jan. 22. His successor has not been named.

U. S. Aeronautical Exhibit

Army, Navy, Standards and Weather Bureaus Depts. To Be Represented

NEW YORK, Jan. 14—The United States Government will have an elaborate exhibit at the first Pan-American Aeronautics Exposition to be held in Grand Central Palace, Feb. 8-15. The War Department, the United States Army, including the aviation section; the United States Navy, the Bureau of Standards, the Weather Bureau and the United States geodetic survey are among the departments to be represented.

The method of intercommunication between aircraft on the European front will be demonstrated. Lieut.-Col. George D. Squier, chief of the aviation section of the Naval Corps, will be present with his staff during the week of the show.

Howard Coffin, chairman of the show committee; Augustus Post, of the Aero Club of America, and Rich G. Hollaman, president of the International Exposition Co., with others representing aeronautic societies, visited Washington last week to go over plans with the Government department executives.

Considerable additional space was contracted for last week. Joseph A. Steinmetz, inventor of the Steinmetz trailer, which enables aeroplanes to land on ships at sea, has arranged for an exhibit at the show.

Chevrolet Dealers to Hold Convention at Oakland

OAKLAND, CAL., Jan. 11—There is to be a convention of the Chevrolet dealers of the Pacific Coast held at Oakland while the automobile show is on at San Francisco. The 200 or more dealers from all over the territory tributary to the factory located in this city are to attend the convention together with many of their agents. The convention is to open the same day as the Pacific Coast Auto Show, and on opening night the dealers at the convention are to attend the show in a body after a dinner tendered by the officers of the factory.

Truck Interests Banquet at Milwaukee

MILWAUKEE, WIS., Jan. 15—R. M. Dobson, special representative of the Kelly-Springfield Motor Truck Co., tendered a banquet to commercial vehicle men who exhibited at the Milwaukee show, Jan. 5 to 11, to promote mutual interests and a stronger feeling of friendship. Mr. Dobson's guests included H. M. Rosenberg, district sales manager, Federal Motor Truck Co.; Oscar Stegeman, president, Stegeman

Motor Car Co., Milwaukee; I. E. Clark, Goodrich Rubber & Tire Co.; L. P. Helm, sales manager, Wisconsin Motor Truck Co.; J. A. DeVoy, state distributor, Gramm-Bernstein Truck Co.; E. K. Wagner, Milwaukee sales manager, Menominee (Mich.) Motor Truck Co.; L. P. Fortin, sales manager, Menominee Motor Truck Co.; L. H. Blaney, district manager, Service Motor Truck Co.; George Barrowman, state representative, International Motor Co.; H. B. Willower, assistant sales manager, Gramm-Bernstein Truck Co.; William P. Evans, special representative, Standard Sanitary Mfg. Co.

Two Automobile Bills in New York

ALBANY, N. Y., Jan. 16—Automobile headlights and the reduction of the minimum age limit of an automobile driver were brought up to-day in bills introduced by Assemblyman Harding Showers and J. D. Kelly, respectively. The Showers bill provides that automobile headlights shall not throw dazzling rays more than 3½ ft. above the ground on a level road. The Kelly bill provides that the highway law shall be amended to allow persons over 16 years of age to operate a car and not make 18 years the minimum legal age, as at present.

Leavitt Takes on Harroun and Premier

NEW YORK, Jan. 13—J. W. Leavitt & Co., San Francisco, Cal., has completed negotiations at the local show to distribute the Harroun, Columbia and Premier on the Pacific Coast. The Harroun territory will cover California, Nevada and Arizona. The Premier territory given Leavitt will embrace the lower half of that State and practically all Nevada. The Leach Motor Car Co., Los Angeles, handles the other half of the State and practically all of Arizona.

Champion Meeting Jan. 20

TOLEDO, Jan. 12—Makers of automobiles and accessories from all parts of the country will attend the third annual get-together meeting of the Champion Spark Plug Co., Jan. 20. More than 800 invitations have been issued.

Harry Newman Forms New Company

ST. LOUIS, Jan. 12—Harry Newman has formed a company known as Harry Newman, Inc., in this city to handle the KisselKar.

Oldsmobile Eight Is 2½ by 4¼

NEW YORK, Jan. 15—In THE AUTOMOBILE for Dec. 28 a typographical error made it appear that the bore of the eight-cylinder Oldsmobile engine is 2½ in. This should have been 2¾. The stroke of the engine, 4¼ in., was correctly given.



Ninth annual banquet of the Motor Accessories Manufacturers held at the Waldorf-Astoria Wednesday evening, Jan. 10. There were over 500 in attendance

70,259 Attend Milwaukee Show

Dealers Expect to Sell 38,500 to 40,000 Cars in Wis. in 1917

MILWAUKEE, WIS., Jan. 12—The official attendance at the ninth annual Milwaukee automobile show, which was held in the Auditorium from Jan. 5 to 11, inclusive, was 70,259, compared with 41,440 in 1916, a gain of 28,819, or nearly 70 per cent. Paid admissions also increased to a remarkable extent, being nearly one-half of the total attendance. All exhibitors declare the show to have been unusually successful in all ways.

The tenth annual show will be held somewhat later in January, 1918, than this year, to avoid conflict with the New York exposition.

The largest truck exhibited at the show was a 7-ton Stegeman, with worm drive, which featured the display of the Stegeman Motor Car Co., Milwaukee. The car, complete with body, as exhibited, weighed 13,122 lb. The rear tires had a combined width of 32 in.

Wisconsin distributors expect to place an aggregate of 38,500 to 40,000 cars in the Badger State for 1917. During 1916, this state absorbed 35,860 cars, an increase of 44 per cent over 1915. The total number registered by private owners was 115,650. The number sold in Wisconsin last year was more than all of the cars in use in this state in 1913, which was 34,646.

It is estimated that 75 per cent of the total number of 1917 dealers in Wisconsin attended the show. This year the Milwaukee Automobile Dealers, Inc., which manages the show, dispensed with the annual banquet in honor of state dealers because no suitable banquet hall could be found to accommodate the large crowd, and also because practically every factory and distributor entertained its dealers at banquets during show week.

Orders 1200 Redden Truck-Makers

NEW YORK, Jan. 15—Negotiations are being completed in a deal whereby one of the largest automobile dealers in Texas contracts for 1200 Redden Truck-Makers, representing a total value of about \$420,000. These units, which are manufactured by the Redden Motor Truck Co., Detroit, are designed to convert Ford chassis for truck use. The Texas firm plans to establish agencies.

Pinkerton Joins Chalmers

DETROIT, Jan. 15—R. D. Pinkerton, formerly an officer in the British army, has joined the Chalmers company and will have charge of a zone.



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Smoothing the Way

FOR a device to exert an influence great enough to bring it to the rank of a factor in civilization it has to have two supreme qualifications: It must be eminently practical and it must be within the reach of the mass of humanity. The greater the degree to which these two fundamental qualities are possessed, the greater the movement. This is the lesson that above all we must learn, and which we must set up as a standard if we are to carry through to its justifiable conclusion the great movement upon which we have embarked.

As milestones in the industry the annual shows offer us a natural resting point to stop and observe the results of the journey. The way has become smoother as we have gone along. The first few miles of the journey as measured by the annual pauses were accompanied by many great questions and uncertainties, and it is only within the last 3 years that the industry seems to be emerging into the light where a cleancut set of fundamentals can be set down as representative of what is desired. Once the aims are known definitely, half the battle is over, and in a review of the seventeenth annual show it is not a difficult matter to see the way in which we are traveling.

Each year the number of car novelties have been dropping off, and yet the variety of invention is in no way less. The lines along which to work have become more clearly defined. It is hard to associate a small gasoline power plant with a world-wide

movement, and yet it is the increasing multiplicity of these little power units scattered all over the face of the earth that has magnified this achievement of science into the rank of a mold of the lives of men. Looking back from 1999 the change in conditions due to mechanical road transport will be seen as at least as great as the change due to railways was obvious in looking back over the nineteenth century.

Detail Progress

IT does not require a number of developments of a radical nature to constitute progress. The seventeenth annual show offers no long list of surprises of a mechanical or decorative nature, and yet it is certainly indicative of a broad movement that denotes an important period of progress.

Without exception every car in the show illustrated some little improvement in one point or another as compared with the design of a year ago. This is true of the cars in the lower end of the price scale as well as in those in the upper end. Taking all these together, the story of advancement is made up.

When the fundamental is so clearly established as it seems to be in the basic ideas of automobile design, it is the detail that is necessary to acquire the efficiency which is the ultimate aim. To be concrete, take the many small improvements which have been made to meet the descending grade of fuel. No one car incorporates all the improvements made in this direction, and yet looking at 1917 cars as a whole the lower grade fuel is being handled better than the higher grades of a decade ago. The amalgamation of these scattered details into common practice are just as important as a measure of progress as the introduction of an entirely new principle. In fact, they are more important, because whatever the principles the details will always be with us.

S. A. E. High-Pressure Sessions

THE 1-day winter meeting of the Society of Automobile Engineers proved an unquestionable success. On Thursday last the business session in the morning and the professional session in the afternoon went with a swing from start to finish. The big auditorium in the Engineering Societies Building was well filled; those who spoke, spoke to the point, and there was practically no wasted time whatever. Of course, everything was condensed to the limit. The Standards Committee chairmen read only such parts of their reports as required the society's confirmation, eliminating the reading of progress matters.

The papers were, in each case, presented by their authors with a minimum of words, and very clearly and concisely. The society has been working for months to make the winter meeting the most successful ever held, and all those connected with the arrangement deserve the heartiest congratulations for their success.

Best Winter Meeting

S. A. E's Last Gathering Under Present Name
Exceeds All Expectations—Professional
Sessions Carried Out with Snap and Vim

By J. Edward Schipper

NEW YORK CITY, Jan. 12—Yesterday brought to a close the most eventful year in the history of the Society of Automobile Engineers. It was S. A. E. day, and starting with the business meeting in the morning, the professional session in the afternoon and ending with the banquet and entertainment in the evening the members and their friends made an occasion that fittingly brought to a close the last meeting of the Society of Automobile Engineers that will ever be held.

When the time for the next mid-summer session rolls around, it will be a new and broader society with a new and broader name. The Society of Automotive Engineers, whose field of endeavor is as broad as the art of self-propelled transportation through the air and over water and land, will succeed it. It only remains for the confirmation of a mail vote to put this into effect.

With the new era come new officers who will carry on the work of their predecessors in the broadened fields. Standardization of the aircraft, the tractor and in the motor marine field will engage a new and broadened standards committee. Professional papers and research work will likewise proceed on a much wider scope.

George W. Dunham, consulting engineer, is the new president of the society. Jesse G. Vincent, vice-president of the Packard Motor Car Co., is first vice-president; Charles M. Manly, is second vice-president. The new members of the council are B. B. Bachman, engineer of the Autocar Co., H. L. Horning, engineer of the Waukesha Motor Co., C. W. McKinley, engineer of the Willys-Overland Co., and F. E. Moskovics, commercial manager, Nordyke Marmon Co. Herbert Chase, assistant manager of the S. A. E., is treasurer of the society.

President Huff's address opened the meeting. He spoke of the successful year which the society has just passed through and of the bright outlook for the future, particularly since the merging of the other automotive societies has been practically consummated. Members of the other organizations are to be permitted to enter the S. A. E. at any time after the date of ratification for a period of 3 months, without the payment of initiation fees.

Another great feature of the society's work as mentioned by Mr. Huff is the increased co-operation with the government. This is a phase of the work which has been growing rapidly and presages a closer connection between the endeavors of the society and those of governmental activities in similar directions. The particular work in which members of the society are assisting the government is the drawing up of standard truck specifications and on the aeronautical division of the standards committee. The society is also in

close touch with the bureau of standards in Washington.

President Huff spoke of the increase in membership of the society, which now has passed the 2000 mark. In January, 1916, there were 1783 members. The total for January, 1917, is 2120, without counting thirty-five additional applications which have just been accepted.

The growth of the standards work is worthy of comment. It had its inception in 1910 and at that time a number of the members of the S. A. E. contributed out of their own pockets to guarantee the work. In 1916 the budget allowed \$7,500 for standards work and the actual cost was \$10,000 and in 1917 it is likely that the expenditures along this line will exceed \$14,000. The financial condition of the society is indicated from the fact that there is a total surplus on hand of \$30,490.

Some of the other business to come before the society at the business meeting which followed President Huff's address concerned constitutional amendments was the matter of change of name, revision of the council to take in the aeronautic and tractor fields, succession of officers and a constitutional revision committee to have in charge such matters and thereby prevent loss of time at the semi-annual meetings. All these were passed along for further consideration and in addition the proposed membership for army and navy officers at reduced fees was tabled.

Standards Committee Business

Nine reports from different divisions of the standards committee were heard and of these eight were accepted in toto and the other, that of the tire and rim division, in part. These will now be passed on by the council and put before the membership of the society for a mail vote before they become accepted standards or recommended practice as the case may be. The reports appeared in THE AUTOMOBILE last week.

The divisions which presented reports were those dealing with aeronautic engines, electrical equipment, electric vehicles, engines and transmissions, iron and steel, miscellaneous parts and fittings, springs, tires and rims and trucks. Little discussion developed on any of the reports except that on the tires and rims. The tire and rim division has had under consideration for the last few years a set of standard loads for solid truck tires. There has been considerable difficulty in reconciling the different tire manufacturers to these loads and the table arrived at in the report represented about the best compromise that could be effected. That it does not meet



GEORGE W. DUNHAM
New president of the Society
of Automobile Engineers

Engineering Work During Show Week

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the ideas of everyone, however, is the immediate cause of its being turned over to the truck standards division for review. The outcome of this action is awaited with great interest by the standards committee, as it presages other important work along this same line in the passenger car tire field.

Accepted Without Discussion

The reports of the electric equipment division, A. L. Riker, chairman; the electric vehicle division, A. J. Slade, chairman; engine and transmission division, E. T. Fishleigh, chairman; iron and steel, K. W. Zimmerschied, chairman; miscellaneous division, J. G. Utz, chairman; springs division, C. W. McKinley, chairman; and the truck standards division, W. P. Kennedy, chairman; were all accepted without discussion. The scope of these divisions are denoted by their names and their particular activities were reported in THE AUTOMOBILE for Jan. 11.

A little discussion developed on the report of the aeronautical engine division on the recommendation of the tapered shaft fitting for propellers. The report covered this feature, spark plugs and a definition in connection with direction of engine rotation.

At the October meeting of the standards committee this division reported in favor of recommending spark plugs having 18 mm. threads for use with aeronautic engines. This report was approved by the standards committee but was referred back to the division by the council, asking for more complete detail dimensions.

Accordingly the division has prepared dimensions as shown on the sketch presented herewith. The thread dimensions correspond with those adopted in Great Britain by the engineering standards committee. No limits have been placed on the pitch diameter of the thread by the engineering standards committee.

Considerable discussion developed on the question of whether metric or English dimensions should be used. In spite of a vote in favor of metric dimensions at the October meeting of the division, several of the members were reluctant to adopt them. It was thought that the question was one of too great importance to be decided out of hand in a division meeting, and that it should be discussed and decided by the standards committee or the council or both.

In order that the proposed standard for spark plugs might be placed on record, dimensions in both millimeters and inches have been provided, the closeness of the equivalents being determined by the degree of accuracy required in the different dimensions.

The design follows the same general lines as the S. A. E. large hex. plug, but the gasket seat and size of hexagon are



C. M. MANLY
Curtiss Aeroplane Co.
Second vice-president S. A. E.

Left—J. G. VINCENT
Vice-president of engineering
Packard Motor Car Co.
First vice-president S. A. E.

26 mm. (approximately 1 in.) instead of 1½ in., this giving an ample gasket seat in connection with the 18 mm. thread.

In addition to the dimensions given in the present S. A. E. standard for spark plug with ¾ in. thread, a limiting dimension has been placed on the height of the plug above the gasket seat, and a definite dimension has been given from the gasket seat to the lower end of the spark plug shell.

In connection with the proposed spark plug standard the division recommends that in every case the tapped hole into which the spark plug is screwed should be counterbored slightly to approximately the outside diameter of the spark plug thread.

Aeronautic Engine Supports

The division recommends three sets of dimensions for bed timbers for supporting engines and aeroplanes. No standardization is thought possible in regard to fore and aft length. The dimensions recommended are as follows, in inches:

Distance between timbers	12	14	16
Width of bed timbers	1½	1¾	2
Distance between centers of bolts	13½	15¾	18

Propeller Hub Dimensions

At the October meeting of the standards committee, the division proposed for acceptance a tapered shaft end for mounting propeller hubs but this proposal was not voted upon. Since that time additional reports have been received from France and from New Mexico, to the effect that the tapered and keyed fitting for propeller hubs is giving perfect satisfaction.

The division therefore submits for adoption as recommended practice practically the same dimensions as were submitted at the October meeting, the only difference being that the proportion of the tapered length to be relieved has been reduced somewhat. Most of the dimensions are given in the English equivalents of the metric dimensions used in France, but may be translated back to metric dimensions if this policy shall be preferred.

The division is not prepared yet to recommend dimensions for hub flanges, etc., but the aviation section of the signal corps will submit drawings suggesting different sizes of hubs.

Direction of Engine Rotation

At the October meeting of the standards committee the division reported definitions of terms for direction of engine rotation. The national advisory committee for aeronautics did not concur in these definitions in its report on nomenclature, and since printing that report has revised its own first definitions.

Because of lack of agreement with the national advisory



B. B. BACHMAN
Engineer Autocar Co.
New member of S. A. E.
council



H. L. HORNING
Engineer and general manager
Waukegan Motor Co
New member of S. A. E. council



F. E. MOSKOVICS

Commercial manager Nordyke & Marmon Co.
New member S. A. E. council



Right—HERBERT CHASE
Assistant manager S. A. E.
Treasurer of the society

committee the council of the society referred the definitions back to the division. The division has reconsidered the matter and is not thoroughly satisfied with any of the definitions proposed. It has accordingly prepared new definitions for direction of engine rotation, making use of the terms "normal" and "anti-normal" in place of the terms which have formerly been used and have caused confusion.

Report of Aeronautic Engine Division

Charles Manly stated that there is great need to standardize the tapered shaft as soon as possible, although there is considerable likelihood that there will be a change. "We are just learning," he said, "that the larger horsepowers are giving trouble. We need data on the larger engines on these fittings as it is necessary in order to make them that we cut into the shaft quite brutally; especially with the hollow type of shaft. With these fittings we cannot guarantee that the shaft will not have to be replaced." An advantage in the taper fitting pointed out by Mr. Manly is that there are no patent complications to be met.

In using the tapered fit Mr. Manly pointed out that the French lap the fitting by putting emery and oil on the hub and lap in the connection with the keys out. After a good fit has been obtained the keys are then inserted. One of the difficulties which must be avoided is the tendency for the shaft to blister under stresses set up by misalignment.

Others speaking on the use of the taper fitting questioned the wisdom of reducing the shaft in the center, stating that a machined hub will give a good fit for the entire length. It was also suggested that it would be better to separate the keys and to see that both keys take the same amount of load. With the proper precautions a 1½-in. shaft was said to be able to transmit a load of 200 hp. at 1100 r.p.m.

E. H. Ehrman, factory manager of the Chicago Screw Co., commented on the spark plug standard suggested and stated that further precautions should be taken in interpreting the metric and inch dimensions and that in the case of pitch it would be better not to mention the inch dimension at all. The report was accepted as recommended practice.

Tire and Rim Discussion

The tire and rim discussion which filled its expected part on the program of being the most-discussed issue on the books, hinged about the recommended standard table of tire carrying capacities of solid rubber tires. This table follows:

Nominal Width of Tire, In.	Gross Load Per Wheel in Pounds	
	Tire Diameter, 36 In. and Under	Tire Diameter, 40 In. and Over
3	1,000	.....
3½	1,300	.....
4	1,700	.....
5	2,500	2,600
6	3,300	3,500
7	4,200	4,500

This is a subject which has been under consideration in various divisions for many years, during which it has been reviewed repeatedly without being able to make any final specific recommendations up to this time. Recent discussions have taken cognizance of present practice in this field and in formulating this table a special effort has been made to base it upon the best available engineering information in the hands of the tire companies. The above table represents the only compromise acceptable to a majority of the tire companies. This schedule if agreed to rationally, and if not abused by overloading will give very satisfactory tire life.

John Younger, chief engineer motor truck department of the Pierce-Arrow Motor Car Co., opposed the table on the ground that it did not coincide with practice. He gave as a specific example the 6-in. size which he said was many hundred pounds under weights which are ordinarily being carried.

C. B. Whittelsey, factory manager of the Hartford Rubber Works, said that the committee had been working on this table for 5 years, and the allowances made are from 50 to 1200 lb. greater than other ratings. In other words, the tire companies are more liberal on these ratings than they have been in any other table ever compiled.

J. E. Hale, experimental engineer of the Goodyear Tire & Rubber Co., seconded Mr. Whittelsey's remarks and said there is no sharp dividing line between the points where tires are under and overloaded. The reputable truck companies are careful and there is less undertiring than in the past. He cited the fact that the 4-in. dual was formerly considered sufficient for the 3-ton truck, whereas this is now equipped with 5-in. duals as common practice. It is realized, he stated, that the more adequate the tire equipment, the less the cost to the truck user.

B. B. Bachman, engineer of the Autocar Co., asked if the figures in the table were arrived at through a mere compromise on the parts of the tire companies or through engineering tests that would justify their use.

K. W. Zimmerschied, engineer of the General Motors Co., replied that the Goodrich and Goodyear companies both submitted elaborate sets of data as compiled by tests. He also stated that the truck standards committee had asked permission to review these figures on account of impending legislation on the allowable amount of wheel load.

George Green, chief engineer of the Fifth Avenue Coach Co., said that speaking from the experience of 1,000,000 miles of travel for his vehicles he has found that an allowable load on the 4 in. size of 1931 lb. instead of 1700 lb. had been very satisfactory, keeping the cost of tires down to 1 cent per mile.

The allowable load part of the report was turned over to the truck standards division as requested with the other parts of the report accepted. The accepted portion of the report was



C. W. MCKINLEY
Engineer Willys-Overland Co.
New member of the council



J. G. UTZ
Perfection Spring Co.
Chairman Standards Committee



E. H. EHRLMAN
Secretary and factory manager
Chicago Screw Co.



C. T. SCHAEFER
Chief engineer Militaire Motor
Vehicle Co.

reviewed in THE AUTOMOBILE for Jan. 11 in the report of the standards committee's session.

The afternoon session was opened promptly, the president calling upon Capt. D. E. Clark, chief aeronautic engineer, U. S. Army, to present a paper on problems in aeroplane construction written by himself, Capt. T. F. Dodd and Mr. O. E. Strahlmann. In connection with this Captain Clark showed a number of moving pictures and lantern slides illustrating aircraft of various kinds engaged in war work in Europe and on the Mexican border. These films had never been exhibited publicly and were of an extremely vivid sort. The paper was reviewed briefly in the last issue of THE AUTOMOBILE, and there was no discussion upon it at the meeting.

Horning Speaks on Tractor Engines

H. L. Horning, engineer of the Waukesha Motor Co., who was down on the program for a paper entitled the Ultimate Type of Tractor Engine, did not read his paper, but instead, delivered a rather illuminating address on the subject.

Mr. Horning said that nothing since the discovery that a hook on the end of a pole would aid in the art of agriculture, had promised to benefit man to such an extent. It will be a factor in reducing the high cost of living. The value of land may be appreciated when it is mentioned that it takes 4 acres to keep a horse alive for a year. The tractor is a workhorse and not a racehorse and unlike the aero engine which must be overhauled every 120 hr. the tractor engine must keep on indefinitely in spite of abuse.

The use of passenger cars by farmers is helping to educate them mechanically in the use of tractors, but it is surprising to note the degree of care that has to be given to the endurance of the tractor: For instance, it was discovered that a greasless type of bearing worked out very well at one point but it was impossible to use it simply for the reason that if the bearing ever did wear out it would be impossible to replace it. The V-belt is a satisfactory device but it had to be abandoned in place of the flat belt because the latter is so much easier to repair.

The tractor engine must have the ability to keep on going. And it must keep on going under difficulties that are enormous. Take the matter of oiling which is so important. Yet instead of getting the proper oil the tractor is apt to get the product of mail order houses which is anything but correct. In one case it was found that a farmer had been using linseed oil in his engine. The use of kerosene also reduces the viscosity of the oil with the result that the rings in the top groove wear three times as rapidly as those in the lower ones. Mr. Horning said he had seen rings wear out in 2 days

while working at 106 deg. in the shade in a Kansas dust cloud. As much as $\frac{1}{2}$ in. of dirt is not infrequent in the crankcase.

In securing efficiency the speed of the engine and the attainment of higher mean effective pressures are the cardinal points. The design of the combustion chamber must be watched and numerous pockets and solid parts to cool must be avoided.

Engine Works at Maximum Speed

What the tractor engine has to work against may be seen when the farmers' method of regulating speed is known. He will sink his plow and if it is too deep, cutting the speed of the tractor down too far he will lift it a little so that the desired speed is attained. In other words the engine is working constantly at maximum torque speed. In every way this is the most difficult work that can be put on this type of engine as it represents constant wide open throttle work, or what would be parallel in automobile practice to a car that is climbing a grade constantly at the highest possible speed at which it can be made to negotiate the hill.

The cooling of the spark plug must be carefully watched and the waterjackets arranged so that a vertical flow of heat will be maintained down the valve stem. Eighty per cent of the troubles are around the exhaust port and the flow of heat on the valve is down the stem from the center of the valve head. The matter of the valve seat is a compromise. If the seat is too narrow the valve will not cool and if it is too wide carbon will form on account of the excessive cooling.

In speaking of the results accomplished in the laboratory Mr. Horning said that he had been able to secure with tractor engines a performance equal in car practice to 42,000 miles of travel at 45 m.p.h. up the steepest hill that the car could climb at that speed.

As features of design he said the bottom of the crankcase is very important as it must take the heat away from the main bearings. On pistons interior ribbing is beneficial. With good design Mr. Horning states that he has been able to run at 98 lb. per sq. in. brake m.e.p. without pounding.

The chief contributor to the discussion on Mr. Horning's paper was R. E. Davis, chief engineer of the J. I. Case T. M. Co. Mr. Davis said that having had experience with many kinds of tractors and tractor engines he found himself in a general way in very close agreement with Mr. Horning. Most of the difficulties and troubles mentioned by the author he has himself encountered, and in his opinion they would be overcome in much the way that Mr. Horning suggested.

A request was made for fuller information regarding the formula given in the paper, and in reply Mr. Horning said it would be hardly possible to do this as it was an empirical formula derived from careful examination of all the data they had been able to suggest. It was pointed out that this formula called for a higher average speed in a tractor engine than is obtained in an ordinary automobile motor, and this, Mr. Horning stated, was regarded by him as essentially true.



F. HYMAN
Presented a paper on dynamic
balancing of rotating parts



N. W. AKIMOFF
Read a paper on proportions in
spring suspension



C. F. SCOTT
Commercial manager Sprague
Electric Works

Left—J. E. HALE
Experimental engineer Goodyear
Tire & Rubber Co.

A tractor engine is worked under the hardest conditions of all since the demands upon it are practically as heavy as those on an aviation engine, while it receives no consideration and no expert attention.

The next paper was that describing the Akimoff balancing machine. The author, F. Hymans of the Otis Elevator Co., drew some diagrams on the blackboard explaining the operation of the machine. His address was almost identical in substance with the digest of the paper published in the last issue of THE AUTOMOBILE.

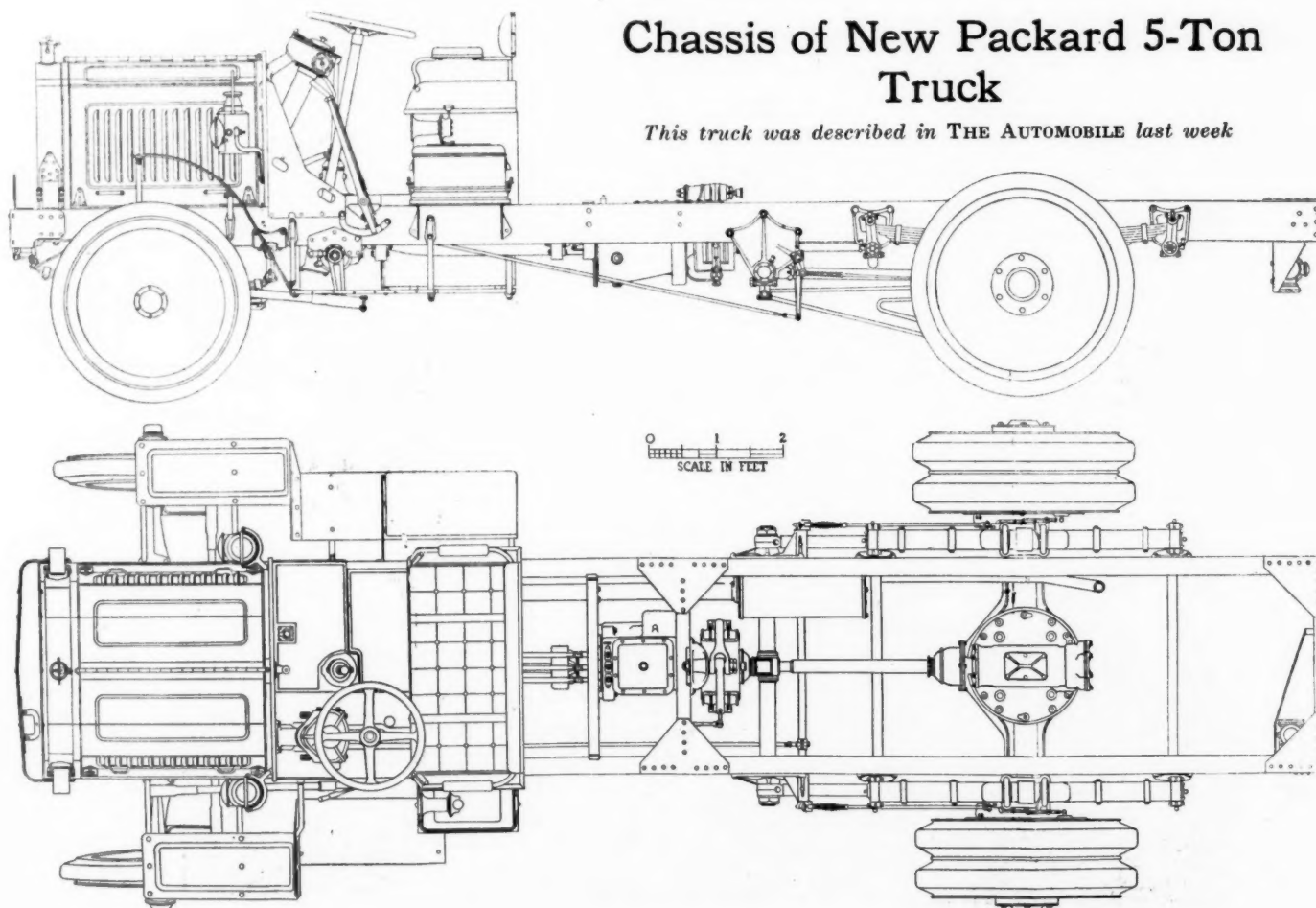
D. G. Roos, experimental engineer of the Locomobile Co. of America, said that they had had an Akimoff machine in use in the factory for some months and had found it very

much superior to previous machines. He said that with the older form, to obtain successful crankshaft balancing, it is necessary to find a man with some gift for the job. If he fell sick or was absent from the factory for any cause, it simply meant that no crankshafts were balanced until he returned or another man was trained. Even a skillful man could not work very fast with the old machine. On the other hand, the Akimoff machine gave absolute information and it required hardly any skill or experience to balance crankshafts satisfactorily. Obtaining the proper balance would, in an ordinary way, take about 15 min., and getting static balance was now more troublesome than getting dynamic balance, according to Mr. Roos.

The last paper of the day was Prof. W. T. Fishleigh's, describing the tests made at the Michigan University to return the amount of heat value in the fuel wasted by an ordinary engine. He briefly recapitulated the main points of the paper as was done in THE AUTOMOBILE last week, and stated that the test he had made encouraged him very much to go further with other types of engine. In fact, the whole course of work was mapped out for the present year.

Several written discussions have been received on this paper largely dealing with other tests which showed conclusions similar to Professor Fishleigh's. The general conclusion appeared to be that these tests showed the enormous price that had to be paid for "reserve power," otherwise to obtain a reasonable fuel efficiency we must use smaller engines and not expect them to produce high torque at very low speeds. If the combustion engine is not improved in some way in its application to automobile service it will be possible for the steam engine to beat it on economy and equal it on performance.

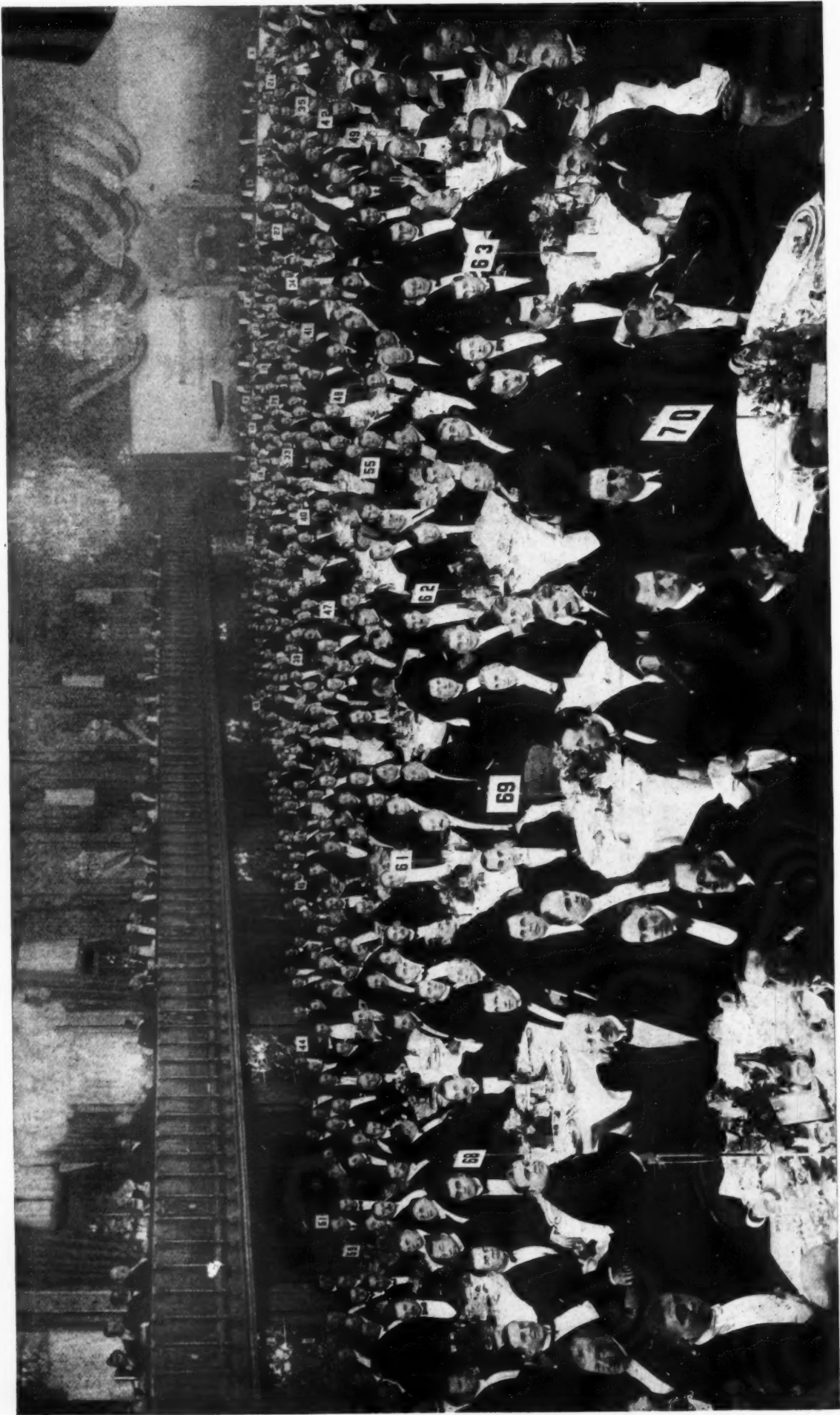
The meeting concluded promptly on schedule, the remaining papers being taken by title.



Chassis of New Packard 5-Ton Truck

This truck was described in THE AUTOMOBILE last week

Annual Banquet of Society of Automobile Engineers



THE Society of Automobile Engineers held its last annual banquet under the present name in the grand ballroom of the Hotel Baltimore, Thursday evening, Jan. 11. When the organization convenes again it will be under the name of the Society of Automotive Engineers. Among the speakers were John Barrett, director-general of the Pan-American Union, who spoke on Pan-Americanism; Its Great Trade Opportunities, and Howard E. Coffin, vice-president of the Hudson Motor Car Co., and member of the Naval Consulting Board, who reviewed national defense.

Poor Methods Handicap Sales in Australia

- ☐ Direct Representation Is Essential to Success of U. S. A. Accessories.
- ☐ U. S. A. Makers Too Frequently Appoint Sole Agents for All Australia, Getting No Results.
- ☐ Must Consider Country as Five Separate Divisions.
- ☐ Preferential Tariff Is the Main Obstacle to U. S. A. Goods.
- ☐ Some American Firms Well Established.

SYDNEY, AUSTRALIA, Nov. 10—Methods pursued by U. S. A. automobile and accessory manufacturers doing business in Australia are in general better than those with other countries, but many U. S. A. accessories and cars are being practically held out of the Australian trade because of poor methods. Very frequently exclusive contracts are given to Australians not in the automobile industry and all they do is collect discounts, perhaps place an agency or so, and put the price of the article so much higher than corresponding articles from Europe as to hurt the sale.

One large American vehicle manufacturer placed the entire agency with a concern not connected with the automobile industry and the only good that can possibly come out of it is the agency for this party. The same has happened with another well-known American car which established the agency 3 years ago and has not placed a single agent in the country.

Should Deal Direct

Australian business men are large enough and the Australian trade big enough so that U. S. A. manufacturers should deal direct, that is, sell direct to the Australian houses. Too frequently U. S. A. makers sell to what are known as "indent" houses. An indent house is known here as a clearing house, but there is a distinction between the two. A clearing house generally charges about 2½ per cent commission, whereas an indent firm will take as much commission as it can get.

A keen Australian business man must be held in his own sphere on a par with a good U. S. A. business man. It is just as likely as not that if Australia had the population of U. S. A. its big business men would equal those of the United States in the same magnitude of business. To draw a parallel: Could you imagine a man like John Wanamaker purchasing goods from any other country through a clearing house or indent house? It is just as impossible to imagine many of our large Australian houses doing business with the U. S. A. in the same manner.

Five Different Divisions

With U. S. A. automobile and accessory concerns doing business in Australia it is first essential that they recognize Australia as five different divisions with each division under the government of a capital town. These five divisions are the various states of the continent, namely; New South Wales, Victoria, Queensland, South Australia and Western Australia.

Further: Do not forget that New Zealand is not Australia or anything connected with it, it has an entirely separate government and home rule on its own account, goods leaving

Australia are dutiable when entering New Zealand and vice versa. New Zealand merchants do not trade with Australia to any great extent as far as importing wares goes.

The greatest mistake an American manufacturer makes is when he appoints an agent to represent his interests solely throughout Australia and New Zealand. The manufacturers believe that this is one country with one business center, but as a matter of fact none of the capital cities in Australia care to accept a sub-agency and this is exactly what the American manufacturer is trying to do.

Many Indent Merchants

For example, Sydney and Melbourne are the two leading cities of Australia, but they are as independent as New York and Chicago; in fact, they are more so as there is a political jealousy existing between the two. These cities are full of indent merchants, few of whom have any capital standing, these indent merchants considering their ends only and nothing for the manufacturer. They will scour all publications carrying advertisements for catchy lines and they will write to the various manufacturers seeking the sole agency for Australia, they have no intimate knowledge of the trade, but are generally commission merchants in the true sense of the word. They write to the manufacturers and ask for the agency of their wares for the whole of Australasia and New Zealand, they give no order with their request, immediately they receive a favorable reply they write to the leading houses all over Australia and offer a certain discount far less than that which the manufacturer gives the indent merchant. Now as the indent merchant has no idea of a fair discount he takes the first discount offered by the manufacturer, but he has no knowledge of competing lines by which he can use as a guide for the judgment of discounts. When the retail man is eventually reached the discount offered to him is insufficient inducement for him to take up the selling agency.

Things are totally different with European markets, the European manufacturers of goods generally send their own factory representative out looking for the proper agents and more often than not the principal of a firm in Europe may be ordered away for 6 months' rest by his medical adviser and he conducts an Australasian tour, he comes here and gets hold of the right people and he has to quote the right prices to get the business, so you can easily see there is a big difference in their methods of appointing agents.

Preferential Tariff Main Obstacle

The greatest obstacle the American manufacturer has to overcome is preferential tariff, which is in favor of the United Kingdom. This varies from 10 to 33 1/3 per cent on most

goods relating to automobiles. For example: Chassis parts throughout are 10 per cent higher dutiable on American goods over these from the United Kingdom and rubber goods carry 33 1-3 per cent. An English chassis is allowed to come into the Commonwealth free, whereas the foreign tariff is 10 per cent.

Tires carry British duty to 36 cents per pound weight or 25 per cent ad valorem duty, whichever happens to be the greater, whereas foreign tariff is 48 cents per pound or 35 per cent ad valorem.

This must be borne in mind, as it is a serious handicap to the foreign manufacturers of accessories. Then again the American manufacturer is a very bad shipper. He understands in his own country all about the railroad workings, but shipping goods overseas is totally foreign to him.

Quote Best Discount First

The average American merchant does not in the first instance quote his best discount, this leaving the price of the product high as the buyer out here is so used to getting the best discount from England in the first instance that he does not think to ask for a better one from America.

Another detrimental thing the American manufacturer is inclined to do, that is, he will let the sole control of the agency to some English firm which, in turn, looks for a representative over the seas. This means three or four profits before it gets into the hands of the retailer; that is, the English house has to make a profit as the distributing center, then in turn it gets in touch with some wholesale house in Australia, and as the big Australian dealers will not deal via England, this simply means two agents' profits to be paid before the retailer gets hold of the goods.

Another feature of the American manufacturer, he will readily place the foreign representation of his goods in the hands of some American distributing house which house asks for too big a profit to insure good representation in this country, and further than that, the leading Australian accessory houses have learned that they can only profitably trade by dealing direct.

Some U. S. A. Firms Have Done Well

Another reason the American goods are not represented so well as they might be is the fact that an Australian merchant who has a desire to take a business trip around the world will commence by going to England first and will spend more time there than anticipated and consequently he has to cut short or cut out altogether his visit to America. It is easily seen that the American manufacturers are at a disadvantage again until we get proper representation such as direct factory representatives armed with the best discounts calling on the best houses in Australia or deal through some big shipping or indent firm in U. S. A. with its Australian office, who will do business on a small commission basis of about 1 to 2 1/2 per cent. There are a few such firms existent in U. S. A. who will undertake this class of business.

Some U. S. A. firms have handled their export trade with Australia remarkably well. One of the best examples is the Goodyear tire, which practically controls the market here. You scarcely see a car in Australia that has not a Goodyear tire on it and frequently all five are Goodyears. Goodyear went about the business properly, sending a man from the factory to look for suitable agents and, not finding any, opened direct factory branches in the five capital cities of the commonwealth. The campaign has been followed up with a strong advertising appropriation.

Other American firms have established themselves strongly in the Australian market. In the accessory field the Stewart products are a good example. They are well and properly represented in every state of the commonwealth and their export business has been well handled.

There is a good opportunity here for U. S. A. accessory firms manufacturing lamps. To-day the lamp market is prac-

tically held by English houses. The U. S. A. lamps do not appeal to the public as they should. Many U. S. A. lamps are represented here but their business has not been properly handled.

Battery Field Is Large

There is a big opportunity for U. S. A. firms manufacturing storage batteries. Starting and lighting battery business is best represented here by Willard. The battery business is going to be a huge thing like tires, and the battery firm that gives the best service, not only in the five capital cities, but also in the country towns, is going to have the best trade, irrespective of the selling price. It means that the battery firm represented throughout the country with batteries ready for immediate use and charged so that the man who has a failure of battery knows he can buy a new one straight away is going to be the leading battery representative.

In the field of engine and hand tire pump most of the trade in hand pumps is handled by English and the engine pumps by Americans. The Kellogg pump has made best progress here, which is due to a successful method of introduction. The whole Australian business is placed in the hands of a New York firm whose Australian office does a large indent business. This firm has gone to the agents of each make of car and has offered, them the sole agency of the Kellogg pump for that particular car, namely, the Overland people have the sole agency for Overlands and so with Buick, Hupmobile, etc. This method is proving very successful.

Some of the U. S. A. best vulcanizer makers are badly represented here, and as a result some English makes are the biggest sellers. For cheaper cars the U. S. A. vulcanizers are holding their own but they have not that percentage of the trade which good business would give them.

In various other lines of accessories the market is split between Europe and U. S. A. There is a field for increased sale for U. S. A. goods in every line. The speedometer field is practically controlled by the Stewart products. Previous to the war Europe controlled the magneto situation but now some U. S. A. products are working in. Bowser has practically an absolute monopoly of the garage gasoline tank situation. Owing to springs paying a 45 per cent duty it is almost prohibited to enforce them. Special Ford radiators are just coming on the market, being introduced by one American concern. Air compressors and portable pumps for garages are all made in Australia. Chains for motor trucks are largely controlled by the English makers. Hexagon nuts, lock washers, bolts, etc., all come from the English market. The best lifting jack trade is in the hands of English manufacturers. The clock market is divided between English and U. S. A. firms. In the carbureter field, the Schebler is in good hands and so is the Master, but outside of these U. S. A. carbureters are not selling.

Makers Lose Opportunities

There are some very peculiar things happening in the selling of U. S. A. automobile accessories in Australia which show that the manufacturers are not at all familiar with the field, as otherwise they would not do such inexcusable bungling. An example is a spark plug maker. Australian houses had been importing these spark plugs from the factory and had been receiving them at reasonable prices. For some unknown reason this factory has left the agency to an indent firm in Australia which is looking for indent orders. The discount now is only about one half and consequently Australian dealers who have been purchasing this spark plug direct are not going to buy any more.

The shock absorber field is largely controlled by U. S. A. makers. In the anti-skid chain business England has 90 per cent of the trade and the remaining 10 per cent split among the different U. S. A. makers. There is a small trade in tire carriers and supports, but the most of these are manufactured locally.

Attack Headlight Glare Problem

Symposium Under Auspices of Society of Illuminating Engineers Brings Out Statements by Engineering, Manufacturing, Legislative and Police Authorities Showing Present Unsatisfactory Conditions

NEW YORK CITY, Jan. 11—A symposium on the headlight glare situation was held last night at the Engineering Societies building under the auspices of the Society of Illuminating Engineers. The subject was discussed from all angles, both technical and legislative as well as from the common sense standpoint of the ordinary user of automobiles.

The discussion was started by a paper by F. W. Little of the Electrical Testing Laboratories, entitled A Survey of the Automobile Headlight Situation. In connection with the paper a number of the leading devices on the market were demonstrated by actual illumination after which the meeting was opened to a discussion by authorities representing the different classes interested in headlight glare. Those who spoke were as follows: Dr. Louis Bell, consulting engineer; Hon. W. L. Dill, commissioner of licenses, State of New Jersey; Deputy Commissioner L. B. Dunham, police department, New York; Dr. H. P. Page, Corning Glass Works, Corning, N. Y.; James Hemstreet, American Automobile Assn.; A. L. McMurtry, Society of Automobile Engineers; Dr. C. H. Sharp, Electrical Testing Laboratories and Prof. C. W. Waggoner, West Virginia University.

The paper by Mr. Little was really a classification and a definition of the construction and operation of headlights. The author states in part that:

The main problem in headlight design is that of applying the light effectively for driving purposes without producing glare. The angle which separates this useful light upon the roadway from that which would produce glare is very small. Also assuming that it is possible and practicable to keep all of the light below a plane passing through the headlight axes, the inequalities in the roadbed would cause this plane to shift to the extent of producing glare when the headlights point upward, and producing but little useful light when they point downward. A balance should be secured between objectionable glare on the one hand and useful driving light on the other.

Requirements for Design

In order to obtain opinions concerning the requirements for headlight design, questions were sent to a number of men who have given thought to the subject. Several of these have very kindly given their views, which are summarized in the accompanying table.

It must be understood that the table shown herewith does not represent a fixed opinion on the part of any of the participants. Most answers as received were qualified by such expressions as "In my mind there is no one ideal distribution characteristic for automobile headlights." "Conditions are different in city and country driving," etc.

The table represents an attempt to tabulate in each case, the compromise which seems the most acceptable to the individual. It has been made up by the author from more detailed expressions of the contributors' views, and the wording has not been submitted to the contributors for approval.

A number of "non-glare" headlight devices have been developed. The principles upon which these depend may be classified as follows:

- 1—By dimming the light.
- 2—By diffusing the light.
- 3—By cutting off the disturbing light.
- 4—By re-direction of the light.
- 5—By special type of reflector.
- 6—By change in the color of the light.
- 7—By tilting the reflector.

Several of the devices available make use of two or more of these principles.

First Principle Is Simplest

The first and simplest principle is the mere dimming of the lights by means of a rheostat or by throwing the two incandescent lamps in series without changing the light distribution. As the beam candlepower is directly proportional to the brightness of the source, the reduction of the beam of this method of avoiding glare would be followed by a similar decrease of light upon the roadway.

The Second Principle

The second principle, that of reducing the brightness of the beam by diffusion, is applied in the form of a diffusing front glass either clear or frosted. Any degree of diffusion required may thus be obtained. The diffusion has the effect of reducing the

beam intensity and contributing the light so gained to the illumination of objects contained within a much wider angle.

Cutting Out Portions of Beam

The third principle, that of cutting out portions of the beam, depends on the fact that if the front end of the lamp filament is placed at the front of the reflector, the divergence of the beam reflected from the top of the reflector will all be above the horizontal, while that from the bottom will all be below the horizontal or axis of the reflector. Hence, if no reflected light from the upper half is allowed to emerge, all the light of the headlight will be along the axis and below it. This may be done by a blind over the top half of the glass front or by a cap over the top of the lamp bulb. This elimination of course reduces the beam candlepower and total flux to an extent which in many instances amounts to one half or more. A variation is made upon this method in some cases by frosting rather than rendering opaque the upper half of the reflector or lamp. Opaque caps covering the upper half

Headlight Gleams

A balance should be secured between objectionable glare and useful driving light.

Non-glare devices operate on seven principles:

- 1—By dimming the light
- 2—By diffusing the light
- 3—By cutting off the disturbing light
- 4—By re-direction of the light
- 5—By special type of reflector
- 6—By change in the color of the light
- 7—By tilting the reflector

Non-glare devices classified:

- 1—Control of light between source and reflector
- 2—Control of light by the reflector
- 3—Control of light after leaving reflector

To conform with present laws headlight glass would have to be changed six times in driving 1000 miles.

Only enforcement of laws will bring non-glaring headlights.

Police dissatisfied with present constructions.

[illegible]

with favor by the law makers, in spite of the fact that a well-designed headlight pointed downward at an angle of 3 deg. the maximum would strike a level roadway 70 ft. in front of the car and the reflected light at the horizontal would be less than 40 per cent. of the beam intensity, while 1 deg. above for the reflected light would be about 15 per cent of the maximum. In many of the devices now in use the cut-off between the maximum and horizontal is not as good as the figures just shown.

Devices for Reducing Glare

It is interesting to note that in spite of the use of almost any device modifying the natural light distribution from an automobile headlight, an opposing driver will invariably allow his headlights to burn full intensity without modification unless one's own headlights are dimmed in passing.

The several devices available for reducing glare may be classified as follows:

- 1—Control of light between the source and reflector.
- 2—Control of light by the reflector.
- 3—Control of light after leaving the reflector.

The first class includes coloring, frosting or otherwise changing the surface of the bulb; and the use of caps and prisms.

The second class involves varying the contours and forms of the reflectors.

The third class involves the use of glass fronts made in the various forms and blinds. The various glass fronts used to control the reflected light may be divided into two classes, the prismatic and diffusing.

Marks Conducts Discussion

The discussion was conducted by L. B. Marks, past-president of the Illuminating Engineers' Society. He spoke of the importance of this problem since there is one automobile to every thirty-two people in the country and also because of the great variety of legislation. He stated that in order to conform with the law a man may have to change the headlight glass in his car six times in driving 1000 miles. He cited a few examples of legislation which showed the rather confused state of the legal side of the question.

Dr. Bell stated that the matter must be a compromise between cutting off light and eliminating glare. He said that as far as a simple glare eliminator is concerned, perfection is obtained by a simple disk of newspaper, the only trouble being that it also removes the illumination. It must be a compromise between extreme diffusion and extreme concentration of the reflected ray. Another point brought out by Dr. Bell is that in the cut-off type of headlamp glare reducer, the focusing of the light is of extreme importance.

A. L. McMurtry, who is a member of the standards com-

mittee of the S. A. E., said that a solution of the problem will never be reached until appearance and price cease to be the main requirements in headlight selection by the automobile manufacturer. Furthermore, he stated that there will be no change in the situation until the laws governing headlight glare are enforced. Regarding the confusion which exists on the subject he said that it is small wonder that this is the case if one stops to think that it is not surprising that a police officer shall not be able to define glare when the engineers have not been able to do so. He mentioned a device which had been brought out showing a rather humorous side of the situation, which when held in the hand of the operator indicated whether the light was glaring or not. He mentioned the fact also that it would not be advisable to give a preliminary report at this time on the activities of the S. A. E. standards committee.

The Police Viewpoint

Sergeant Richey of the New York police force, representing Deputy Commissioner L. S. Dunham, stated that the New York police force has an open mind on the glare subject but so far has not seen a single headlamp which was effective for country illumination that really complied with the law. The same fact is borne out by the opinion of the London police. He states that in many instances where he has been called upon to give decisions whether or not a headlight is glaring he has always decided against the headlight. He stated that the lamps giving the flat horizontal ray in which the height should not be more than 42 in. at 75 ft. are all right on flat roads, but on hills they are apt to be the contrary of correct. He also mentioned a variety of places where it would be impossible to see a pedestrian with the ordinary type of headlight and emphasized the importance of this by stating that there is one person killed on the streets of New York every 14 hr. and one injured every 23 min.

Tail Lights Also Culpable

Sergeant Richey also said that the commissioner had requested him to call the attention of manufacturers to the fact that the tail lights in most instances did not comply with the New York State law which said that they should render the numbers legible at a distance of 50 ft. in the direction that the vehicle is traveling.

James Hemstreet, representing the American Automobile Assn., spoke on the desire of the A. A. A. to protect the users of the highway, both pedestrians and occupants of vehicles, while the others went into the scientific side of the question from the standpoint of the suggestion of methods of diffusion of the rays so as to remove the objectionable glare while at the same time preserving the required amount of road illumination.

Standing Records Recognized By A. A. A. Contest Board

DIVISION ONE

Competitive Records

SPEEDWAY RECORDS, CLASS "B" STOCK CHASSIS (Piston Displacement)

161 TO 230 CUBIC INCHES

Miles	Time H.M.S.	Driver	Car	Place	Date
4	3:49.00	Witt	E. M. F.	Atlanta	Nov. 3, 1910
5	4:35.47	L. Chevrolet	Buick	Indianapolis	July 2, 1910
10	8:55.40	L. Chevrolet	Buick	Indianapolis	July 2, 1910
20	19:51.00	Knipper	Chalmers	Atlanta	Nov. 12, 1909
50	50:36.00	Nelson	Buick	Atlanta	Nov. 9, 1909
100	1:40:46.81	Knipper	Chalmers	Atlanta	Nov. 10, 1909

231 TO 300 CUBIC INCHES

5	4:16.00	Dawson	Marmon	Indianapolis	July 2, 1910
10	8:16.03	Harroun	Marmon	Indianapolis	May 27, 1910
20	17:10.70	Chevrolet	Buick	Atlanta	Nov. 11, 1909
25	21:48.92	Harroun	Marmon	Indianapolis	May 30, 1910

50	42:41.33	Harroun	Marmon	Indianapolis	May 30, 1910
75	67:31.07	Harroun	Marmon	Atlanta	Nov. 11, 1909
100	1:30:08.31	Harroun	Marmon	Atlanta	Nov. 11, 1909

301 TO 450 CUBIC INCHES

5	4:05.76	Kincaid	National	Indianapolis	May 27, 1910
10	7:55.12	Aitken	National	Indianapolis	July 2, 1910
15	11:48.78	Aitken	National	Indianapolis	July 1, 1910
20	15:57.63	Dawson	Marmon	Indianapolis	May 27, 1910
50	39:47.35	Dawson	Marmon	Atlanta	Nov. 3, 1910
75	1:00:16.34	Dawson	Marmon	Indianapolis	May 27, 1910
100	1:23:43.11	Kincaid	National	Indianapolis	May 27, 1910
150	2:05:02.17	Chevrolet	Buick	Atlanta	Nov. 9, 1909
200	2:46:48.47	Chevrolet	Buick	Atlanta	Nov. 9, 1909
250	4:38:57.40	Burman	Buick	Indianapolis	Aug. 19, 1909

451 TO 600 CUBIC INCHES

5	4:01.36	Oldfield	Knox	Indianapolis	May 30, 1910
10	7:47.71	Robertson	Fiat	Atlanta	Nov. 11, 1909
20	15:57.41	De Palma	Fiat	Atlanta	May 5, 1910
50	42:02.93	Robertson	Fiat	Atlanta	Nov. 13, 1909
100	1:22:35.35	Robertson	Fiat	Atlanta	Nov. 13, 1909
150	2:05:00.63	Robertson	Fiat	Atlanta	Nov. 13, 1909
200	2:53:48.32	Disbrow	Rainier	Atlanta	Nov. 13, 1909

SPEEDWAY RECORDS, CLASS "C" NON-STOCK (Piston Displacement)

161 TO 230 CUBIC INCHES					
5	4:20.20	J. Nikrent	Buick	Los Angeles	April 15, 1910
10	8:40.17	J. Nikrent	Buick	Los Angeles	April 15, 1910
15	13:14.52	J. Nikrent	Buick	Los Angeles	April 9, 1910
20	17:37.36	J. Nikrent	Buick	Los Angeles	April 9, 1910
25	21:12.42	Tower	Flanders	Los Angeles	May 5, 1912
50	43:49.69	Endicott	Cole	Los Angeles	April 9, 1910

231 TO 300 CUBIC INCHES					
1	0:45.60	De Palma	Mercer	Los Angeles	May 5, 1912
2	1:31.53	De Palma	Mercer	Los Angeles	May 5, 1912
3	2:17.17	De Palma	Mercer	Los Angeles	May 5, 1912
4	3:02.70	De Palma	Mercer	Los Angeles	May 5, 1912
5	3:47.34	De Palma	Mercer	Los Angeles	May 5, 1912
10	7:27.33	De Palma	Mercer	Los Angeles	May 5, 1912
15	11:11.17	De Palma	Mercer	Los Angeles	May 5, 1912
20	14:56.05	De Palma	Mercer	Los Angeles	May 5, 1912
25	18:53.20	J. Nikrent	Case	Los Angeles	May 5, 1912
50	42:30.08	Siefert	Dorris	Los Angeles	April 8, 1910
75	1:03.54	Harroun	Marmon	Los Angeles	April 8, 1910
100	1:25:22.07	Harroun	Marmon	Los Angeles	April 8, 1910

301 TO 450 CUBIC INCHES					
5	3:49.36	J. Nikrent	Buick	Los Angeles	April 17, 1910
10	7:36.61	J. Nikrent	Buick	Los Angeles	April 17, 1910
15	12:04.99	Dawson	Marmon	Los Angeles	April 15, 1910
20	16:04.40	Harroun	Marmon	Los Angeles	April 15, 1910
25	20:08.69	Harroun	Marmon	Los Angeles	April 15, 1910
50	39:53.55	Harroun	Marmon	Los Angeles	April 15, 1910

451 TO 600 CUBIC INCHES					
5	3:38.61	Oldfield	Knox	Los Angeles	April 16, 1910
10	7:20.66	Oldfield	Knox	Los Angeles	April 16, 1910
15	11:32.34	Marquis	Isotta	Los Angeles	April 10, 1910
20	15:29.18	Marquis	Isotta	Los Angeles	April 10, 1910
25	19:24.92	Marquis	Isotta	Los Angeles	April 10, 1910
50	39:20.69	Marquis	Isotta	Los Angeles	April 10, 1910

DIVISION TWO Non-Competitive Records

SPEEDWAY RECORDS, CLASS "B" STOCK CAR (Piston Displacement)

231 TO 300 CUBIC INCHES					
Distance	Time	Driver	Car	Place	Date
10	7:54.40	Mulford	Hudson	Sheepshead Bay	Nov. 25, 1915
20	15:45.80	Mulford	Hudson	Sheepshead Bay	Nov. 25, 1915
50	39:30.80	Mulford	Hudson	Sheepshead Bay	Nov. 25, 1915
100	1:20:21.40	Mulford	Hudson	Sheepshead Bay	Nov. 29, 1915

SPEEDWAY RECORDS, CLASS "B" STOCK CHASSIS (Piston Displacement)

160 CUBIC INCHES AND UNDER					
1	0:56.80	Witt	Flanders	Indianapolis	Nov. 13, 1911
5	4:22.98	Witt	Flanders	Indianapolis	Nov. 13, 1911
10	9:27.49	Witt	Flanders	Indianapolis	Nov. 13, 1911
15	14:13.26	Witt	Flanders	Indianapolis	Nov. 13, 1911
20	19:00.87	Witt	Flanders	Indianapolis	Nov. 13, 1911

SPEEDWAY RECORDS, CLASS "C" NON-STOCK (Piston Displacement)

160 CUBIC INCHES AND UNDER					
5	4:26.08	Evans	Flanders	Indianapolis	Nov. 13, 1911
10	8:53.97	Evans	Flanders	Indianapolis	Nov. 13, 1911
15	13:24.00	Evans	Flanders	Indianapolis	Nov. 13, 1911
20	17:54.82	Evans	Flanders	Indianapolis	Nov. 13, 1911

SPEEDWAY RECORDS, REGARDLESS OF CLASS, NON-STOCK

1/4	8.16	Burman	Blitzen-Benz	Indianapolis	May 29, 1911
1/2	16.60	Oldfield	Christie	Tacoma	July 5, 1915
1 kilo	21.40	Burman	Blitzen-Benz	Indianapolis	May 29, 1911
1	31.60	Oldfield	Christie	Tacoma	July 5, 1915
2	1:10.00	Oldfield	Christie	Tacoma	July 5, 1915
3	1:54.83	Bragg	Fiat	Los Angeles	May 5, 1912
4	2:33.37	Bragg	Fiat	Los Angeles	May 5, 1912
5	3:00.00	Orr	Maxwell	Omaha	July 5, 1915

ONE MILE CIRCULAR DIRT TRACK RECORDS, NON-STOCK

1	46.20	Disbrow	Simplex	St. Louis, Mo.	Aug. 8, 1914
2	1:32.60	Disbrow	Simplex	St. Louis, Mo.	Aug. 8, 1914
3	2:27.81	Disbrow	Simplex	Cleveland, O.	Sept. 14, 1912
4	3:17.02	Disbrow	Simplex	Cleveland, O.	Sept. 14, 1912
5	4:06.59	Disbrow	Simplex	Cleveland, O.	Sept. 14, 1912

STRAIGHTAWAY RECORDS, CLASS "B" STOCK CHASSIS (Piston Displacement)

231 TO 300 CUBIC INCHES					
1	35.11	Mulford	Hudson	Daytona	April 10, 1916
301 TO 450 CUBIC INCHES					
1 kilo	26.75	Mers	National	Jacksonville	Mar. 29, 1911
1	40.32	Wilcox	National	Jacksonville	Mar. 30, 1911

STRAIGHTWAY RECORDS, REGARDLESS OF CLASS, NON-STOCK

1 kilo	15.88	Burman	Blitzen-Benz	Daytona	April 23, 1911
1	25.40	Burman	Blitzen-Benz	Daytona	April 23, 1911
2	51.28	Burman	Blitzen-Benz	Daytona	April 23, 1911
5	2:34.00	Hemery	Darracq	Daytona	Jan. 24, 1906
15	10:00.00	Lancia	Fiat	Daytona	Jan. 29, 1906

(Standing Start)

1	40.53	Oldfield	Benz	Daytona	Mar. 16, 1910
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Hour Records

SPEEDWAY, CLASS "B" STOCK CHASSIS (Piston Displacement)

231 TO 300 CUBIC INCHES					
12 hours	924 miles	Mulford	Hudson	Sheepshead Bay	May 1-2, 1916
24 hours	1819 miles	Mulford	Hudson	Sheepshead Bay	May 1-2, 1916

SPEEDWAY RECORDS REGARDLESS OF CLASS, NON-STOCK

Distance	Time	Driver	Car	Place	Date
1	40.23	De Palma	Mercedes	Des Moines, Ia.	June 24, 1916
2	1:12.85	Resta	Peugeot	Sheepshead Bay, N. Y.	Sept. 30, 1916
3	1:54.81	De Palma	Mercedes	Des Moines, Ia.	June 24, 1916
4	2:20.08	Resta	Peugeot	Sheepshead Bay, N. Y.	Oct. 9, 1915
5	2:56.35	Resta	Peugeot	Omaha, Neb.	July 15, 1916
10	5:45.03	Aitken	Peugeot	Sheepshead Bay, N. Y.	Sept. 30, 1916
15	8:54.72	Mulford	Peugeot	Omaha, Neb.	July 15, 1916
20	11:15.79	Aitken	Peugeot	Sheepshead Bay, N. Y.	May 13, 1916
25	15:00.38	Mulford	Peugeot	Omaha, Neb.	July 15, 1916
50	28:04.63	Resta	Peugeot	Sheepshead Bay, N. Y.	Oct. 9, 1916
75	45:05.31	Rickenbacher	Maxwell	Omaha, Neb.	July 15, 1916
100	56:57.72	Resta	Peugeot	Sheepshead Bay, N. Y.	Nov. 2, 1915
150	1:26:58.65	Aitken	Peugeot	Sheepshead Bay, N. Y.	Sept. 30, 1916
200	1:55:23.53	Aitken	Peugeot	Sheepshead Bay, N. Y.	Sept. 30, 1916
250	2:23:01.03	Aitken	Peugeot	Sheepshead Bay, N. Y.	Sept. 30, 1916
300	2:55:32.23	Anderson	Stutz	Sheepshead Bay, N. Y.	Oct. 9, 1915
350	3:24:42.99	Anderson	Stutz	Sheepshead Bay, N. Y.	Oct. 9, 1915
400	4:04:48.98	Resta	Peugeot	Chicago, Ill.	June 26, 1915
450	4:35:05.78	Resta	Peugeot	Chicago, Ill.	June 26, 1915
500	5:07:26.00	Resta	Peugeot	Chicago, Ill.	June 26, 1915

ONE MILE CIRCULAR DIRT TRACK RECORDS—NON-STOCK

10	8:16.40	Burman	Peugeot	Bakersfield, Cal.	Jan. 3, 1915
15	12:23.20	Burman	Peugeot	Bakersfield, Cal.	Jan. 3, 1915
20	16:25.60	Burman	Peugeot	Bakersfield, Cal.	Jan. 3, 1915
25	20:28.80	Burman	Peugeot	Bakersfield, Cal.	Jan. 3, 1915
50	40:57.80	Burman	Peugeot	Bakersfield, Cal.	Jan. 3, 1915
75	1:08:56.00	Burman	Peugeot	Galesburg, Ill.	Oct. 22, 1914
100	1:31:30.00	Alley	Duesenberg	Hamline, Minn.	Oct. 24, 1914
150	2:30:51.00	Wishart	Mercer	Columbus, O.	Aug. 25, 1912
200	3:21:48.00	Mulford	Mason Spel.	Columbus, O.	July 4, 1913

STRAIGHTWAY RECORDS, CLASS "B" STOCK CHASSIS (Piston Displacement)

161 TO 230 CUBIC INCHES					
5	4:24.13	Towers	Warren-Detroit	Jacksonville	Mar. 29, 1911
10	9:10.52	Towers	Warren-Detroit	Jacksonville	Mar. 30, 1911
231 TO 300 CUBIC INCHES					
10	8:16.35	Wilson	Cole	Jacksonville	Mar. 29, 1911
301 TO 450 CUBIC INCHES					
5	3:56.82	Wilcox	National	Jacksonville	Mar. 30, 1911
10	8:03.67	Mers	National	Jacksonville	Mar. 29, 1911

STRAIGHTWAY RECORDS, REGARDLESS OF CLASS—NON-STOCK

10	5:14.40	Bruce-Brown	Benz	Daytona	Mar. 24, 1909
20	13:11.92	Burman	Buick Bug	Jacksonville	Mar. 30, 1911
50	35:52.31	Burman	Buick Bug	Jacksonville	Mar. 28, 1911
100	1:12:45.20	Bernin	Renault	Daytona	Mar. 6, 1908
150	1:55:18	Disbrow	Special	Jacksonville	Mar. 31, 1911
200	2:34:12	Disbrow	Special	Jacksonville	Mar. 31, 1911
250	3:14:55	Disbrow	Special	Jacksonville	Mar. 31, 1911
300	3:53:33.50	Disbrow	Special	Jacksonville	Mar. 31, 1911

Hour Records

SPEEDWAY, REGARDLESS OF CLASS, NON-STOCK

1 hour	74 miles	Harroun	Marmon	Los Angeles	April 16, 1910
2 hours	148 miles	Harroun	Marmon	Los Angeles	April 16, 1910
24 hours	1491 miles	Verbeck & Hirsh	Fiat	Los Angeles	April 8, 1910

ONE MILE CIRCULAR DIRT TRACK, REGARDLESS OF CLASS, STOCK CHASSIS

24 hours	1196 miles	Patschke & Mulford	Lozier	Brighton Beach	Oct. 15, 1909
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ONE MILE CIRCULAR DIRT TRACK, REGARDLESS OF CLASS, NON-STOCK

24 hours	1253 miles	Poole & Patschke	Stearns	Brighton Beach	Aug. 19, 1910
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STRAIGHTAWAY, REGARDLESS OF CLASS, NON-STOCK

1 hour	81.65 miles	Disbrow	Special	Jacksonville	Mar. 28, 1911
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Zeppelin Power Plant Engineering

Part I

An Exhaustive Study of the Details of German Aircraft Engine Construction as Embodied in Zeppelins Recently Brought Down in England

EDITOR'S NOTE—*Special facilities for the examination of these engines have been offered engineers by the English government in the hope that the science of aviation engine construction will be broadly benefited thereby.*

OUR British contemporary, *The Automobile Engineer*, announced in its December issue that it will publish a series of articles giving the detail of the engines of some of the Zeppelin airships which have fallen into English hands. Special facilities have apparently been offered by the government for the examination of these engines, and the idea presumably is that all aviation engine builders will find something helpful in this close study of the latest German designs.

Since this is at least as interesting to American constructors as to any others, we propose to reprint these articles almost in full; the first of the series following hereunder:

Our first, and present, description is of the Maybach engine, as fitted to the Schutte Lanz and Zeppelin airships. This engine is probably of the latest Maybach design, and presents many interesting features, although main interest really centers around the parts that are more in the nature of accessory fittings, made necessary or advisable by the particular application of the engine, viz., airship propulsion. Before proceeding to describe the engine and its accessories in detail, a general outline of the function and layout of the more unusual fittings will doubtless be of interest.

Instead of regarding each portion of the engine accessory system as a separate item, it will probably be simpler to regard each fitting as a separate item in reviewing its purpose in the general layout, and also to confine our attention at the moment to those parts not usually found on an aircraft engine.

Oil Supply Controls Fuel

Referring to the general diagram of the oil and fuel pressure system, Fig. 1, it will be seen that in the top left-hand corner there are two pumps driven by a common crank that is attached to a shaft, this shaft being worm gear driven off the engine crankshaft. The horizontal pump is that for the fuel, and it will be noticed that the valves of this pump are far removed from the pump itself, being located at the base of the chamber seen at the bottom left-hand corner of the general diagram. The reason for this arrangement is the practical impossibility of pumping liquid gasoline, so that a column of air has been interposed between the pump and the fuel itself. It will be noticed that the fitting containing the fuel pump valves also carries the oil filter, of course, definitely divided off, but incorporated in the body of the same fitting. The reason for this is most probably that it happened to be convenient to embody the two in one. There does not seem to be very much reason to suppose that the two are combined with a view to warming the fuel and alternatively cooling the oil. Its position on the engine is denoted by the letter A in the general arrangement diagram of the engine, Fig. 2.

The fitting shown at the right-hand bottom corner of

Fig. 1 is really merely the float chamber to the carbureter. It functions somewhat differently, as it is arranged to operate at varying altitudes, but in effect it serves the purpose of a float chamber to feed the carbureter reservoir. Its position relative to the engine is shown at B in Fig. 2, and it has probably been located in the position shown from motives of safety, as evidently, in the position shown in the general diagram, danger arising from a float chamber near to the engine is avoided.

With reference to the oil system, this is made clear in a detailed description following, and calls for no special note at this point, except as regards the control that the oil pressure exercises over the fuel supply. This control is clearly shown to the right in the diagram, Fig. 1, where connection will be seen between the jet damper and an oil controlled vertical piston. This piston is under oil pressure, and serves merely to hold out of action a stop that controls the jet cut-off, so that as long as the oil pressure maintains the fuel supply continues. When the oil pressure drops below a predetermined limit, the piston rises under the influence of its spring, releasing a catch and so closing the jet. Oil to this fuel controlling piston is distributed through a centrifugally-governed piston valve that is adjustable externally, the oil being throttled by means of an adjusting

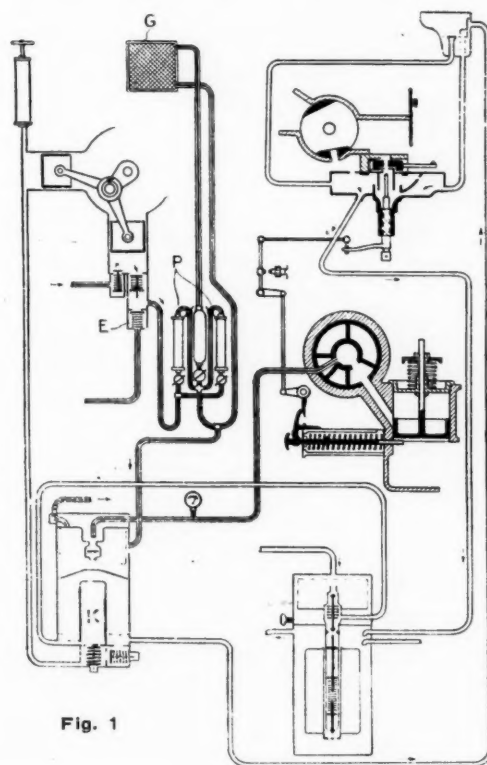


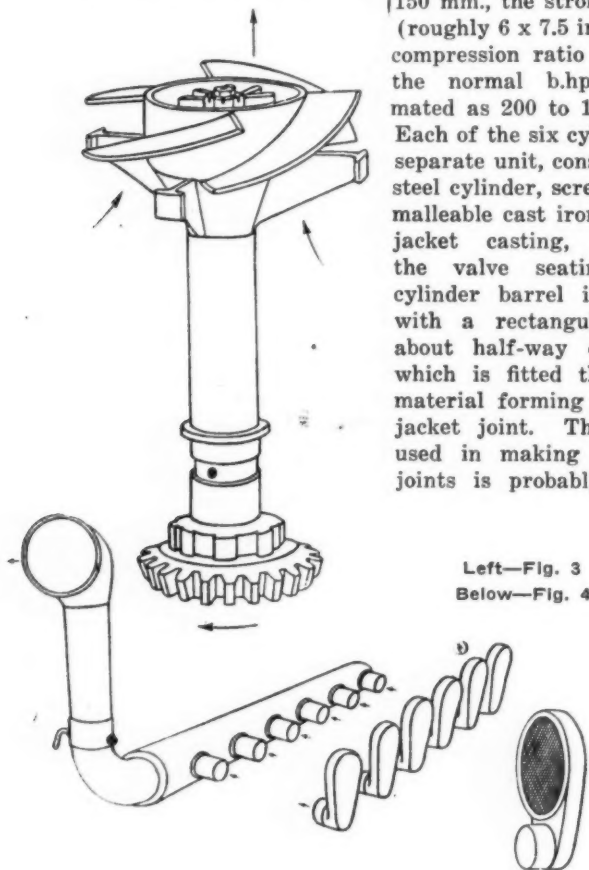
Fig. 1

lever that limits the travel of the piston valve, so that by the setting of the lever, the actual oil pressure in the lubricating system is determined. This explanation does not quite coincide with the positions assigned to the oil piston valves and ports in another diagram, but the present diagram, Fig. 1, gives a satisfactory explanation of the principle of the control. Evidently the piston controlling the fuel cut-out stop can, by so arranging the strength of its spring, be given a certain range of action; that is to say, it can be designed to maintain its position and hold off the fuel stop between any range of oil pressure required, say, from 5 lb. minimum to 35 lb. maximum, according to the strength of the spring, which merely needs to be strong enough to overcome the minimum pressure decided upon, as it is not until oil pressure drops that there is any necessity for cutting off the fuel.

The carbureter, which is shown in the top right-hand corner of the diagram, Fig. 1, needs no general explanation at this stage, and will be described in full detail later. The small oil radiator, together with the system of filters beneath it, are simply the oil cooling and filtering circuit, and, as a matter of fact, it is believed that these were, by a curious whim of the chief engineer, generally cut right out of service when the airships were in use.

The engine starting mechanism consisted of a pump and the necessary mechanism for filling the cylinders with mixture, which was ignited by a geared-up hand starter. Fuller details of this system are given in the following pages.

With regard to details of the engine itself, the bore is 150 mm., the stroke 190 mm. (roughly 6 x 7.5 in.), and the compression ratio 5.94 to 1; the normal b.hp. is estimated as 200 to 1,200 r.p.m. Each of the six cylinders is a separate unit, consisting of a steel cylinder, screwed into a malleable cast iron head and jacket casting, containing the valve seatings. The cylinder barrel is provided with a rectangular groove about half-way down, into which is fitted the packing material forming the water-jacket joint. The material used in making the water joints is probably asbestos,



Left—Fig. 3
Below—Fig. 4

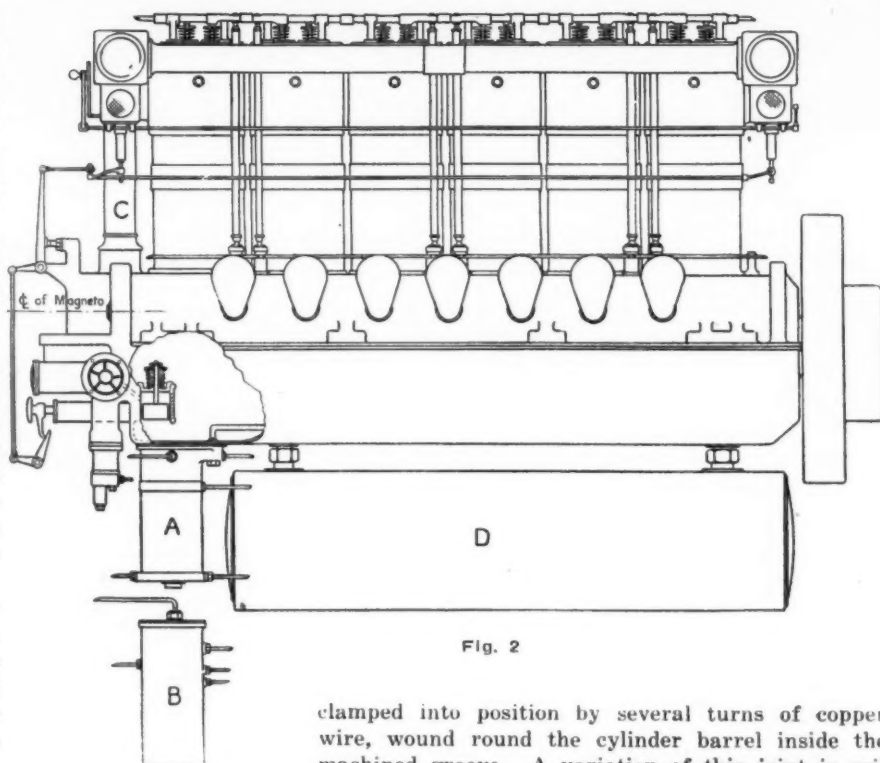


Fig. 2

clamped into position by several turns of copper wire, wound round the cylinder barrel inside the machined groove. A variation of this joint is evidently in use, as on a cylinder carried on the Zeppelin as a spare a large union nut was employed at the flange, and a plain joint used in the cylinder head. The cylinder barrel is hardened at its base, or holding-down flange for strength.

Five Valves Per Cylinder

Five valves per cylinder are arranged, the two inlet ports being 48 mm. diameter and the exhaust ports 35 mm. diameter. The exhaust valves are situated on the left-hand side of the engine looking from the flywheel and propeller end, and all the valves are of the overhead type, working vertically in the water-cooled cylinder head, and operated by rocker arms. All the three valve rocker arms for the exhaust valves are in one stamping, and are operated by one push rod. Similar construction and actuation are adopted for the inlets, the push rod ends being cupped, and the rockers and tappets arranged with spherical heads to correspond. The rocker arms are on hollow spindles supported on brackets bolted to the cylinder heads. No adjustment is provided other than the adjusting screw on each valve rocker arm.

Simple Water Joint

The valve gear is operated by two camshafts, one on either side of the crankshaft. These are driven by gears inside the crankcase at the flywheel end. Cam rollers are fitted to the tappets in the usual manner.

The large circular water joint between each of the six cylinders is made by a 6½-in. diameter rubber and wire ring about ½ in. thick, encircled by a band clip of sheet brass. This clip, when screwed up, reduces the diameter of the packing ring, causing the rubber to expand, thus making a simple face joint against the two machined faces of the water jackets. Water cooling is by a pump working vertically inside the water lead to the front cylinder in an extension of the crankcase casting. The pump spindle with vane shown in Fig. 3 is driven directly off the crankshaft bevel gear at twice the speed of the engine; its position is shown at C in Fig. 2.

The diameter of the water inlet pipe leading from the radiator to the crankcase extension is 2¼ in. Water from the pump enters the aluminum water jacket surrounding the

front carbureter, which is attached to the 6½-in. water joint flange of the front cylinder, and thence the water flows through all the cylinder jackets and, circling the water jacket of the other carbureter attached to the flange of the rear cylinder, enters the copper water jacket surrounding the exhaust manifold, whence a return pipe leads back to the radiator. The crankcase is internally scavenged and cooled by inducing a current of air, as shown in Fig. 4. A marine-type cowl that projects through the roof of the gondola leads direct to a large aluminum pipe, tapering in diameter, arranged externally beside the crankcase and communicating with it by six short branches.

Attached to the crankcase in a similar position on the opposite side are six breathers, or gauze-covered ventilators, that stand vertically and flat against the crankcase. The arrangement of this breathing or scavenging is as shown in Fig. 4, but it should be noted that the cowl opening is toward the rear of the ship, so that scavenging takes place by suction induced by the ship's motion.

The cylinder holding-down bolts are pegged into the crankcase casting at the top, and are provided with flanges, so that the bearing caps are not disturbed when the cylinders are removed, as the holding-down bolts pass right through the crankcase top half in the usual manner. Each cylinder is held down by four clamps or dogs.

With regard to lubrication, oil is drawn by the vertical oil pump, Figs. 1 and 5, from the oil service tank D, Fig. 2. situated below the crank chamber, through the check valves directly below the pump piston by a pipe leading to the two vertical filters P, whence the oil is led into the top of the small oil cooler or radiator G, Fig. 1. This cooler is situated outside the gondola.

After passing through the cooler, the oil returns through the main oil filter K to the main bearings. The main bearings can also be lubricated direct from the pressure pump, cutting out the oil-cooking system by the cocks below the

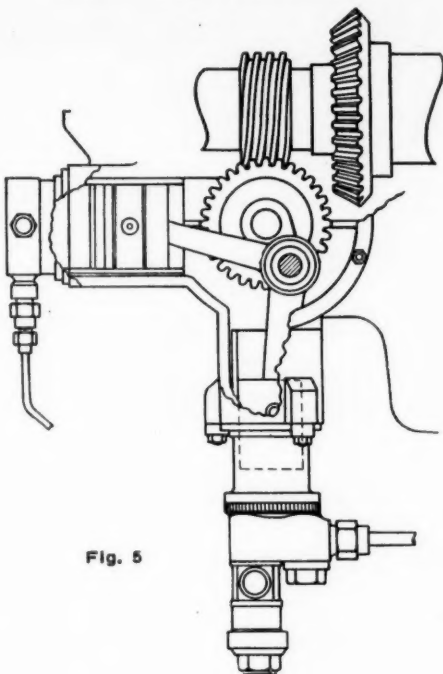


Fig. 5

troughs clamped together by a 7 mm. bolt through the hollow crank pin. The weight of the complete crankshaft with camshaft driving pinion and bevel gear for driving the water pump, etc., is about 99 lb.

The pistons are of cast iron, fitted with three rings above the wrist pin, each piston weighing, complete with pin and rings, 10.84 lb. The pin is 38 mm. diameter, and is located by a set screw, screwed vertically into the pin from the bottom of the pin boss inside the piston and locked with a cotter pin inside the hollow wrist pin.

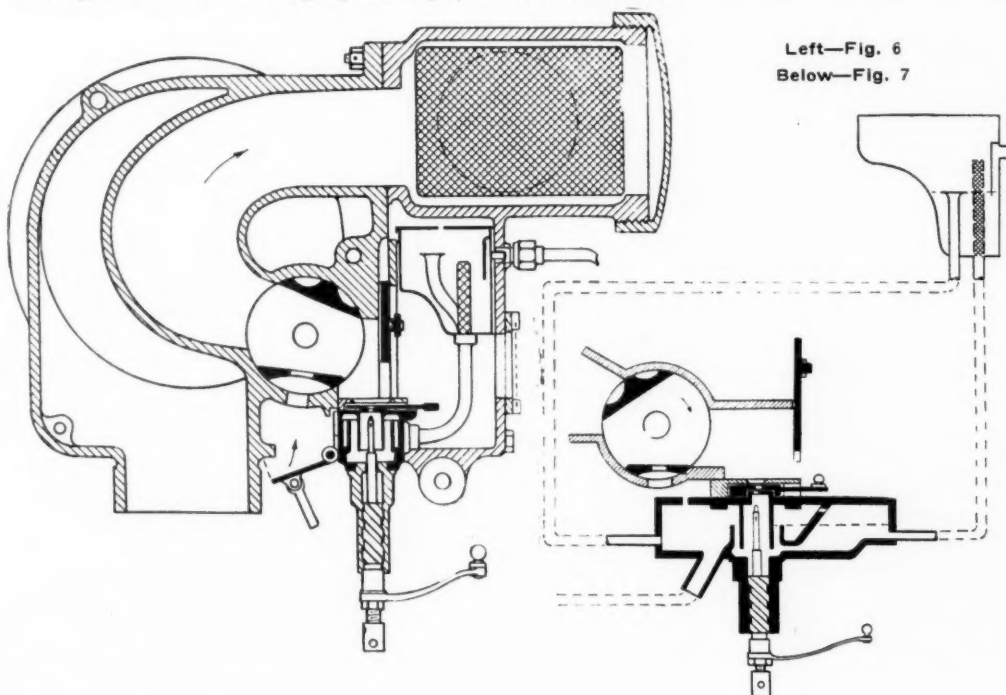
The connecting rods are square section externally, 33 mm. each way, and are bored up the center with a 26-mm. hole, through the center of which an 11-mm. pipe is fixed, leading from the big end bearing to the piston pin bush for lubricating the small end.

Each engine is fitted with two separate carbureters, situated at either end of the engine itself. They are attached to the water jackets of the end cylinders by the water jacket flanges. A sketch arrangement of the carbureters showing the position of the jet, throttle valve, and constant head jet reservoir, and also the water jackets, is shown in Fig. 6.

The large cylindrical wire gauze baffle adjacent to the carbureter, and at the end of the induction pipe shown in the sketch, is presumably to stop firing back into the carbureter. It might also further break up the mixture.

A detailed account of the working of the carbureter, with its unusual system of fuel supply, will doubtless be of interest, and in Fig. 7 is given a diagram of the carbureter, that has been prepared to show the observed interior construction. The carbureter consists of the following parts: A barrel throttle, a main air regulator, a jet, and damping device, and a constant head gravity fuel feed reservoir.

The rotary barrel throttle



Left—Fig. 6
Below—Fig. 7

opens on one side to the inlet pipe, on the other to a mixing chamber. In the lower portion of the barrel is a large extra air port registering with a port in the casing. The size of this port is further controlled by an air shutter (not shown).

The main air regulator is of the sliding shutter or guillotine type. It opens or shuts as the throttle opens or shuts, being interconnected by bell crank levers.

Variable Jet

The jet has an eccentric hole covered by a cap also with an eccentric hole, so that rotation of the cap regulates the area of the jet hole. The arrangement appears similar in action to the jet of the White and Poppe carbureter. The jet cap is also interconnected with the throttle and air slide, opening when they open, and vice versa.

The jet damping device is interconnected with the lubrication system, but might have been operated separately, if desired.

The constant head gravity petrol feed to the jet, in lieu of the usual and adjacent float feed, is provided by a small reservoir placed a little higher than the jet, that is fed from the float chamber, in turn fed from the pump and the separate air vessel or valve box.

It may be safely assumed that the operation of the carbureter, so far as carburetion is concerned, is the same as in the White and Poppe; that is to say, the quality of the mixture is, at any throttle opening, kept constant by mechanical means, i.e., the interconnection of the throttle air and jet orifices, as shown in Fig. 9. Means of adjustment of the relative setting of these three are provided.

Peculiar Fuel Feed

The method of obtaining a constant feed to the jet without the usual float chamber is as follows: Fuel is fed into the upper reservoir seen on the right-hand side at the top of Fig. 7. From this reservoir it flows via the gauze filter-ended feed pipe downward to the jet container, which, it will be noticed, is divided into two compartments by an inclined wall having a passage at its base leading into a short, wide "sealing" chamber or tube that is open at the top. At the top of the inclined wall is an air vent leading into the second compartment, and to the left in the top wall of the latter is another vent leading to the outer atmosphere. (It should be noted that this air vent does not in the actual construction come near the air intake port in the side of the throttle, and is only shown in that position owing to the

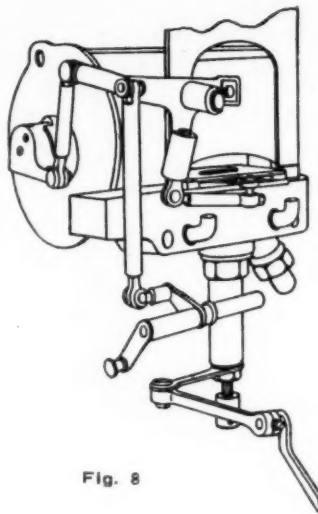


Fig. 8

exigencies of diagram making.) The hole forming the jet proper is drilled through the top face of a short cylindrical boss projecting up from the cover of the jet container. The exterior of this boss forms the bearing upon which the eccentric jet cap rotates. Downward from the cover, and surrounding the jet boss, there depends a tube open at the lower end and reaching almost to the bottom of the "sealing" tube referred to above. Gasoline, then under the influence of gravity, flows from the upper reservoir into the first compartment and thence into the "sealing" tube, from which the jet draws as much as required; any surplus flow rises over the edge of the "sealing" tube and runs away into the overflow pipe at the base of the second chamber seen to the left in the diagram. As the upper reservoir tank and the "sealing" tube are both open to atmospheric pressure,

the feed of gasoline to the jet is unaffected by variation in altitude; that is to say, the level in the jet remains constant during any change in atmospheric pressure, as is not the case with the ordinary float feed. If more fuel than required is fed into the upper reservoir it is carried away by the overflow pipe therein down into the second chamber, and thence, together with the surplus from the "sealing" tube, away to the fuel supply regulator, or float chamber, shown in Fig. 9.

Three Units in Fuel System

In the fuel feeding system to the carbureters there are three units—a pressure pump, a valve box, and a float chamber or fuel regulator. The relative connection of these can be seen in the arrangement diagram, Fig. 1.

Figs. 5 and 10 show the fuel pump system. An extension of the shaft driving the governor carries a small crank pin from which two connecting rods proceed to two pistons and pump cylinders set at right angles.

Three Connections

The horizontal or fuel pump has three connections, viz., a small bore pipe connected to an auxiliary hand pressure pump, and a pipe to dial gauges carried on the side of the crankcase, while the other connection proceeds to the cylindrical fitting containing the valves for the pump. This fitting is bolted to the bottom of the crankcase, as indicated at A in the general lay-out diagram, Fig. 2, and is shown in detail in Fig. 11.

(To be continued)

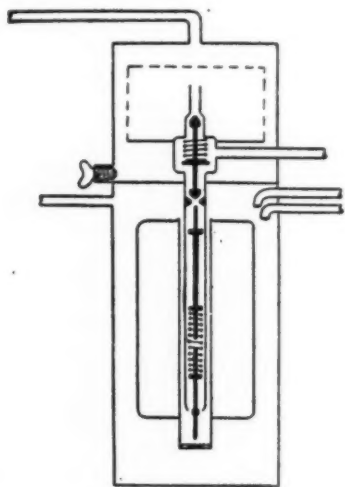


Fig. 9

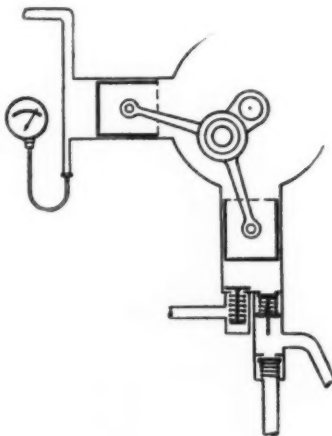


Fig. 10

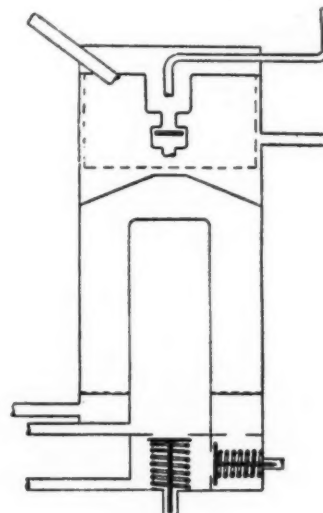


Fig. 11

Car Makers' Conference on World's Export Trade

More Than Forty Export Managers Meet Under Auspices of N.A.C.C. in U.S.A.'s First Automobile Export Conference—Requirements for S. A., China and Other Fields

NEW YORK CITY, Jan. 12—More than forty export managers of automobile manufacturing concerns, members of the National Automobile Chamber of Commerce, Inc., met to-day in an export conference, the first of its kind ever held in this country. The conference, held under the direct supervision of the N.A.C.C., was brimful of practical export ideas and the nine papers presented and the discussion which followed demonstrated that the co-operation which has been characteristic of this chamber in its matters relating to domestic affairs will be extended to its export field. The conference was featured by a general spirit of co-operation. One export manager told his troubles to the others; there was a general laying of the cards on the table; there was a general calling a spade a spade; and in short many resolutions were drafted to the N.A.C.C. which should result in improving export trade.

One of the main subjects was whether U. S. A. makers should build special cars for export trade or whether they should sell foreign countries the U. S. A. standardized car. E. W. Davenport, export manager of the Maxwell Motor Co., prepared a paper which took the stand that U. S. A. makers have been able to produce a low-priced car of high quality because of manufacturing but one model. If it were necessary to build another model for export or to modify the existing one, that would add to the expense and make it necessary to sell at a higher figure, thereby, to an extent, sacrificing part of the great advantage gained in production.

Discussions are always the most valuable parts of such papers and this subject was plainly discussed by over a dozen export managers. The final consensus of opinion was that a committee should be appointed to draft resolutions to the N.A.C.C. Irrespective of what this committee may report, sentiment among the exporters favored the idea of selling the U. S. A. car which lists at less than \$1,000 in the U. S. A. in essentially its present form to foreign countries. There is practically no foreign competition for a car of this price and consequently little necessity for re-making it for export trade, particularly when remaking it means higher prices.

On the other hand, those American cars selling between \$1,500 and \$3,000, which have foreign competition in their fields, will have to be modified as necessary to meet trade conditions. Color options and other options are liberally given in the home market and they will have to be extended to the foreign dealer. In this connection many makers feel they

should give 60-in. tread, as German, Italian, French and English makers are offering such inducements. Right-hand steering must be given in both classes and the majority of manufacturers are agreed on this. The question of necessary clearance is also a debatable one.

U. S. A. manufacturers have generally agreed to discontinue the manufacture of 60-in. tread for export work, this action dating as of Jan. 1, 1917. To overcome any handicap placed on our manufacturers by this section it was agreed that an educational movement for road improvement in foreign countries should be favored and that manufacturers and associations should lend their support to such a movement. The foreign dealer could be shown what has been done in the U. S. A. by way of road improvement in such states as Iowa, Nebraska, Kansas, Missouri, etc., where dirt roads are dragged and otherwise treated.

The value of China as a foreign market was analyzed by Charles Denby, export manager of the Hupp Motor Car Co., who has spent many years in that country. With its 450,000,000 population, Mr. Denby considered China one of the greatest future fields for the automobile. Before the automobile will take hold it will be essential to build roads, which should be encouraged by the American industry. Mr. Denby strongly advocated members of American firms personally visiting China and investigating the field.

On the subject of the South American market, David Beecroft, directing editor of THE AUTOMOBILE, made several recommendations as to the best method of capturing the South American trade. Argentina, one of the greatest South American fields, is badly in need of roads, and to stimulate this movement the U. S. A. manufacturers should institute a road improvement propaganda for that country. With the large landowners such a movement could be readily fostered.

Need Electrical Equipment Service

A second essential in the South American field, according to Mr. Beecroft, is the necessity of having influential members of our different companies visit and become acquainted with the South American field. Our makers have relied too much on so-called export men who are not close enough to our automobile industry. What South America needs is a closer personal relationship between its dealers and our manufacturers. With such a relationship many of the existing export troubles will vanish.

A better service covering the electrical equipment of

Export Conference Opinions

Sell cars under \$1,000 unchanged abroad.

Modify more expensive types as necessary.

Discontinue exportation of 60-in. tread cars.

Encourage good roads movements abroad.

Study foreign markets more thoroughly.

Co-operate with other U. S. A. manufacturers.

Improve service available for foreign users.

Send shipments forward regularly.

Elevate grade of catalogs for export.

Check crating closely to cut shipping expense.

U. S. A. cars is needed in the Argentine field. Electric starting, lighting and battery ignition are entirely local to U. S. A. so far as invention and manufacture are concerned. Because of this U. S. A. makers should furnish expert service assistance for educating the dealers in the South American field. Mr. Beecroft recommended co-operation among six or eight makers on this electrical service and suggested one service expert man for Argentina and another for Brazil.

In several foreign countries, and also in the Philippine Islands, there has been much opposition to battery ignition and U. S. A. makers have had to equip their cars with magnetos for such trade. Investigations have revealed the fact that the opposition to battery system has largely been one of ignorance which could to an extent be overcome by such an educational service plan.

Spare Parts Essential

For the South American trade it is essential to have an adequate supply of spare parts at such centers as Buenos Aires and Rio de Janeiro. No U. S. A. manufacturer should go into the South American field without being pledged to carry a large supply of spares. This has been a serious handicap to our foreign trade, not only in South America but in Denmark, Scandinavia, British South Africa, parts of Australia and other British possessions.

A further essential for foreign trade in South America as well as any other country, is that the U. S. A. maker must allot a certain percentage of his output for foreign dealers, and their shipments must go forward as regularly as home shipments. A foreign dealer cannot be expected to pay rent for a salesroom, maintain a sales force, carry on advertising campaigns, and undertake other expenses in connection with selling a product, and then not be given cars at the season he requires them.

Export Catalog Requirements

The subject of catalogs in foreign languages, as well as instruction books, etc., was discussed by F. B. Amos, foreign advertising manager of the Studebaker Corp. of America. Mr. Amos analyzed the difficulty of getting the correct translations for catalogs, advertisements, etc., and suggested the necessity of not only securing the best translators but paying them a fair price. There is too much effort after cheap translations. Cheap translations generally are a boomerang. Wrong words are used and entirely wrong conceptions given. It is often necessary to have two or three different men check a translation. Literature for foreign countries must be well illustrated, particularly for Latin countries. The text must be short and direct but not so concise as for U. S. A. literature. Bombastic statements must be avoided as they may serve for local use, but are not in good order in foreign countries where they are misinterpreted. Mr. Amos suggested that advertisements for foreign countries should not be written at the U. S. A. factory. This work should largely be left in the hands of the foreign dealer. He strongly recommended instruction books in different foreign languages and that these should go forward with the first shipment of cars, a practice followed by France and Germany.

Must Check Crating Closely

The various ins and outs of crating cars for export, shipping, etc., was handled by M. J. Budlong, of Gaston, Williams & Wigmore, exporting organization of New York City. Mr. Budlong's paper told the necessity of closely checking the crating of cars for export. On one shipment of fifty cars the crates were made 1 in. too high, which increased the shipping cost \$300 on the lot. The carpenters in charge had explicit instructions as to size, but close checking was necessary while the work was going on. If this crating is not

closely watched many thousands of dollars will be foolishly expended each year in this way. The paper also referred to the difficulty of not properly addressing crates for the foreign trade and cited as an example one shipment of 250 crates which was to be shipped from the port of New York on a certain steamer. The crates arrived by railroad the afternoon before shipment at which time it was discovered they were not correctly addressed. The work of re-addressing was commenced, but was not completed in time, and the shipping space was taken by another shipper. The net result was delayed shipments with consequent troubles. Conditions of this nature are constantly coming up in the export field.

Alfred Reeves, general manager of the association, presided, and in attendance were the following:

A. S. Watson (Allen); Geo. H. Strout, export manager (Apperson); J. I. Farley, second vice-president (Auburn); A. M. Bates (Autocar); F. C. Irons, export manager (Bartholomew); W. D. Loomis, manager freight department (Cadillac); L. E. Blocker, foreign department (Chalmers); W. S. M. Mead, vice-president (Chandler); Arthur Hurtig, manager export division (Chevrolet); Pablo Homs, export manager (Cole); J. W. Fulreader, treasurer, C. A. Baird, sales manager (Cunningham); Xavier Ch. De Nice, export manager (Davis); G. W. Werden, export manager, C. T. Chenevert, traveling representative, Beckwith Havens, traveling representative (Denby); H. M. Robins, foreign sales manager (Dodge); John Reid, export department (Dort); G. B. Pratt, secretary, C. R. Bissell, export agent (Elkhart); Tom O. Jones, export manager (Empire); R. N. Lockwood (Federal); S. E. Ackerman, assistant to president (Franklin); P. S. Steenstrup, vice-president, J. A. Olt, assistant manager, G. W. Hawkins, assistant treasurer (General Motors Export); G. T. Stannard, C. B. Warren, manager New York branch, G. F. W. Poggenberg, manager export department, W. L. Day, general manager (General Motors Truck); E. T. Sayers (Garford); C. H. Meeker, manager agency department (General Vehicle); H. B. Phipps, export manager (Hudson); Charles Denby, export manager (Hupp); T. J. Turk, assistant general manager, B. W. Twyman, general manager, J. B. Crockett, manager export department, Amos White, assistant export manager, E. B. Proudfoot, manager traffic department, A. Vaccola (Inter-State); H. H. Robinson, assistant to president (Kelly-Springfield); W. R. Vogeler, export manager (King); J. A. Kline, general manager (Kline); F. T. Newton, sales manager (Lewis Spring & Axle); Emery Huston, advertising and assistant sales manager (Lexington-Howard); E. A. Travis, general sales manager (Locomobile); L. B. Berger, assistant treasurer (Lozier); A. H. McFarlan, president (McFarlan); G. H. Hodges, assistant general sales agent, W. T. Stevens, manager for export (Mack); C. O. Assmus, export sales manager (Maxwell); F. H. Dodge, treasurer, Otto Marx, vice-president (Milburn); C. H. VanDervoort, sales manager, D. M. Beal (Moline); J. I. Handley, president, A. Moorhouse (Mutual); John A. Rose, export sales manager (Nash); A. E. Vinton, export manager (National); H. H. Brand, treasurer (Ohio Electric); R. F. Gifford, foreign manager (Paige-Detroit); W. S. Paterson, secretary (Paterson); R. C. Getsinger, sales manager, C. F. Carew (Saxon); H. T. Holder, export manager (Scripps-Booth); R. H. Salmons, vice-president, W. F. Reynolds, export manager (Selden); H. A. Houser, assistant manager automobile department (Standard Steel Car); W. P. Held, New York branch manager (Sterling); J. P. Roberts, F. B. Amos, foreign advertising manager, F. R. Lackey traffic department (Studebaker); R. T. Yeats, director of exports (United Detroit); Maurice Walter, president (Walter); H. G. Root, general manager (Westcott); Jay Rathbun, manager foreign department (White); R. J. Archer, export department (Willys-Overland); O. F. Baughman, sales manager (Winton); Thos. Clements, vice-president (Woods).

Unique Fageol Truck Spring Lubrication

New 2-Ton Design Has Oil Reservoirs Supplying Every Shackle Bolt—
Dog Clutch Type Transmission

THE outstanding feature of the Fageol truck, to be made by the Fageol Motor Co., Oakland, Cal., is the unique system of spring lubrication, details of which are shown in the accompanying illustration. The upper view shows the support for the rear end of the front spring. The frame bracket is hollow and can be filled with oil, a wick leading from the reservoir to the center of the upper shackle bolt. This is drilled out and bored with a cross hole, allowing the oil to pass to the left-hand end, thence it goes down through a hole in the side of the shackle to the lower bolt which is also drilled to carry the lubricant to the middle of the bushings.

Ample Spring Suspension Oiling

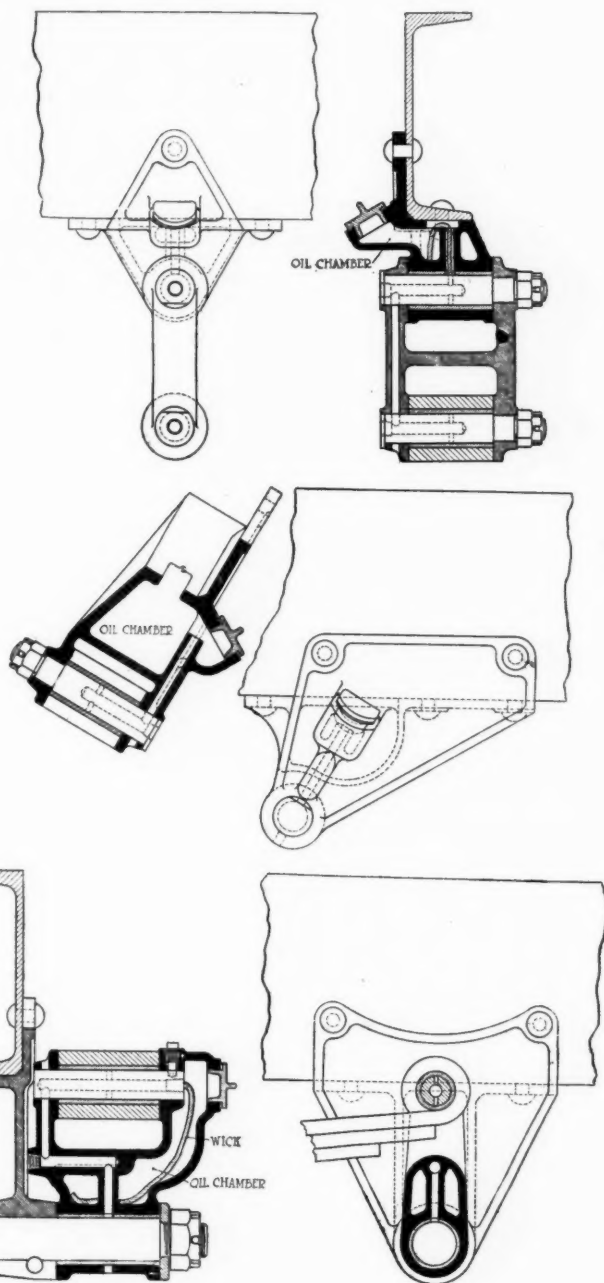
The lower view shows the suspension for the front end of the rear springs, the section being a projection on the center line of the filler cap. It will be noticed that the oil capacity here is very large indeed. At the bottom is the rear end hanger for the rear spring, in which the wick lifts the oil from the reservoir to the upper bolt.

There have been many attempts to obtain automatic lubrication of this nature, but the Fageol design certainly appears to be in advance of anything of the kind previously on record. Proper spring shackle lubrication is enormously important, especially on a truck, and spring bolt wear is one of the most troublesome things in truck service. Thus the evidently costly construction of the Fageol is without doubt worth while. It is not stated how often oil has to be replenished in the reservoirs, but this operation would certainly not have to be performed except at fairly long intervals. Something of this sort has, eventually, got to be provided for all vehicles, passenger cars and trucks alike, so the illustrations are worthy of study by all engineers.

Fixed Spark Magneto Used

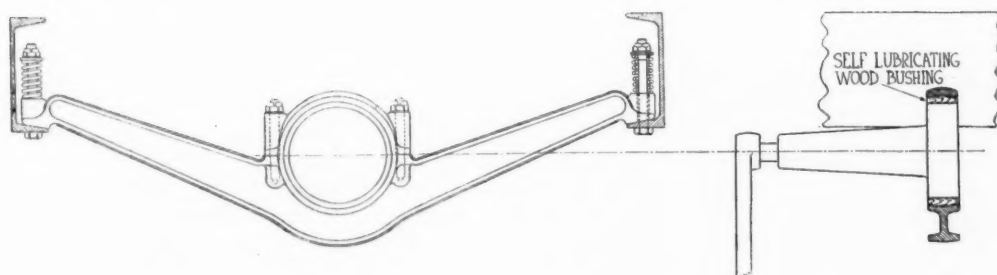
A Waukesha engine is used with a stroke of $5\frac{1}{4}$, and the bore will be either $3\frac{3}{4}$ or $4\frac{1}{4}$. The transmission includes a gearbox which has constant mesh gears selected with dog clutch engagement and the main clutch is a Borg & Beck three-plate. The final drive is by overhead worm and the propeller shaft is divided, there being four universal joints and the center bearing attached to a cross member of the frame.

Hotchkiss drive is used and both brakes are internal on the rear axle. A rather unusual engine feature is the employment of a fixed spark magneto, the carbureter being a Zenith. The wheelbase is 144 in. and the tires 34 by 4 front and 36 by 6 rear.



Above—Details of oil-containing spring shackles and hangers used on Fageol truck

Left—Beam supporting front end of power plant. Note the wood bushing used



The Ultimate Tractor Engine

90 Per Cent of All Farms Require Four-Cylinder Engine of 16 to 40 Hp. Operating on Four Stroke Cycle—A Formula for Calculating Most Satisfactory Operating Speed

By H. L. Horning

General Manager Waukesha Motor Co.

IT would be presumptuous for any man to attempt to prophesy the type of tractor engine, if any, which will ultimately survive, particularly since the tractor industry is the youngest of all hopeful industries. So incomplete is the science of tractor farming, so limited is the development of the art that any man entitled to be called a tractor engineer can be called a pioneer.

Tractors have passed through three distinct phases of development up to this time: First, steam threshing engines; these hardly could propel themselves owing to the excessive weight per horsepower developed and could haul only the water and coal needed for a journey of a few miles. A large number of these are being used for threshing service. Second, steam tractors for threshing and plowing; these were much lighter per horsepower developed and could travel a longer distance on the fuel and water that they could carry. Third, the tractor equipped with internal-combustion engines, which is developing rapidly along the line of less weight per horsepower and toward the ideal of a drawbar pull equal to the weight of tractor under standard conditions.

It is the object of this paper to analyze some of the factors that have influenced tractor development, with the hope that a statement of these will aid any thoughtful student of tractor engineering to form his own conclusion regarding the ultimate type of engine.

Conditions Influencing Development

The old type of tractor was built with the belief that high traction ability depended entirely on weight, a mistaken idea based on the supposition that road friction was the governing factor in a tractor's ability. This led to design of tractors whose weight was much greater than that of any other moving vehicle; highway bridges for agricultural districts were designed having a maximum load capacity equal to or greater than the weight of the largest tractors. Enormous engines were required to propel these tractors, and many of them labored under the handicap of having only 20 per cent of the horsepower developed available for traction in average soil, owing to the high tractive resistance and inefficient transmission mechanism.

As the development goes on, the usefulness of the tractor becomes broader. The number of farmers who can afford them is increasing, because of the decreased price; the reliability is becoming greater and the possible applications more numerous. The usefulness of tractors increases as:

- 1—Weight of tractor per horsepower developed decreases.
- 2—Weight of engine per horsepower decreases.
- 3—Transmission losses decrease.
- 4—Tractive ability of drive-wheel becomes greater.
- 5—The longitudinal center of gravity of tractor and the drawbar hitch are more effectively placed.
- 6—Output of useful work in unit time divided by the initial cost increases.
- 7—Total cost per unit of work done decreases.
- 8—Price of tractor approaches the average income of farms that are suitable for tractor application.

9—Range of conditions under which the tractor can operate successfully broadens.

10—The tractor can do a number of things well on the farm.

11—Knowledge of the care and operation of its component parts becomes prevalent among farm users.

12—As the following questions regarding the tractor can be answered to the satisfaction of the farmer:

a—How many plows can it handle?

b—How much does it cost?

c—Will it burn kerosene?

d—What else can it do besides plowing?

e—How long can it last?

f—Is the engine the same type as in his car?

g—Can he get repairs promptly?

An analysis of these twelve factors would cover the entire art of tractor engineering. We must therefore proceed with the discussion of those factors relating to the powerplant.

We will have defined a type of engine if we can establish general specifications that will make for tractor usefulness in the following respects: (a) range of horsepower for the tractors that can be used on the average farm; (b) most logical cycle for such service; (c) number of cylinders; (d) mean effective pressure required; (e) fuel range; and (f) governor control.

It is generally conceded that all tractors satisfactory for plowing must have ability to pull not less than two plows on the average soil. At least 90 per cent of all farms can be worked with two to four-plow tractors, taking 10 hp. minimum and 20 hp. maximum at the drawbar. Various power demands on the farm exceed 20 hp. and it is useful to have an engine delivering 30 hp. The tractor engine that will do most of this work does not exceed 35 b.hp. The remaining 10 per cent of the farms will require between 35 and 70 hp. We are chiefly interested in the ultimate engine for the 90 per cent and can therefore figure on engines of between 16 to 40 hp. In establishing these limits we must consider the increased tractor efficiency to be expected in the future and also the low efficiency in some larger types of tractors; we can do this by allowing 8 b.hp. per plow for the most efficient and 10 b.hp. for the least efficient construction.

Available Cycles

The brake horsepower desired from an engine has a profound influence on the cycle, since the area and design of the combustion chamber determine the power produced from any cycle.

Undoubtedly the future holds much in store for the development of engines operating on the Diesel and semi-Diesel cycle, but it is doubtful if their weight can ever be decreased to such an extent that their greater efficiency will overcome the disadvantages of the decreased traction efficiency due to their great weight. In the distant future, when there is a real shortage of the lighter fuels, it may be necessary for mankind to use an engine that will burn the heaviest oils.

The two-stroke cycle engine with its simplicity seems ideal,

but up to this time attempts to make a reliable and economical engine have failed. The complications resulting are far worse than those that the cycle attempts to correct.

Other new cycles are being proposed from time to time, but every demand of successful tractor operation seems to be fulfilled by the four-stroke cycle engine. Not the least of its advantages is the intimate knowledge the farmer has of the cycle, resulting from his experience with his automobile, stationary engine and the gas tractor as built up to this time.

The horsepower per cubic-inch displacement or the weight per horsepower cannot be improved by any other cycle, all other things taken into consideration. We must therefore consider that the four-cycle engine is and will be the most suitable for tractor service and will be the ultimate type.

Four Cylinders Best

The indications are that there is a tendency toward four-cylinder engines. No doubt this tendency is strongly influenced by the prevalence of that type on automobiles. The satisfaction it is giving in sizes between 16 and 40 hp. in automobile and tractor service is the influence that is making four cylinders the standard. Several successful tractors are equipped with two-cylinder horizontal-opposed engines; these have worked very well, considering the difficulties inherent in their design. These can be summarized as follows:

1—The tendency for the shaft to revolve longitudinally in the plane of the crankpins due to centrifugal, inertia and gas forces. This tendency loosens the main bearings by throwing the shaft out of line. The crankpin bearings ride alternately on one side of the pin and then the other, causing damage and necessitating frequent adjustments and replacements.

2—Great weight of reciprocating parts compared with the brake horsepower, augmenting the difficulties enumerated under (1).

3—The high centrifugal forces as compared with the brake horsepower, resulting in effects as listed under (1).

4—Difficulty in cooling the large piston and valve heads necessary in obtaining 20 hp. per cylinder.

5—Difficulty of maintaining a perfect mixture in the long intake header as well as the impossibility of attaining high volumetric efficiency with the high velocity necessary for maintenance of mixture quality.

6—Difficulty in lubricating all parts sufficiently without over-lubricating the cylinder.

7—The disadvantageous location of the valves.

8—Infrequency of impulse, the lack of balance and its influence on the transmission mechanism.

The history of internal-combustion engines of all types and number of cylinders is a succession of efforts to increase both the working speed and mean effective pressure. Investigation of internal-combustion engines has developed an empirical formula (1) that gives the speed at which the average engine works most satisfactorily. The formula takes into consideration the weight of reciprocating parts, efficiency of cooling and lubricating systems and the rate at which inertia forces vary with speed.

$$S = \sqrt{\frac{3,000,000}{0.04545 B^3}} \quad (1)$$

In which S is the most satisfactory working speed; the factor 3,000,000 depends on the cooling and lubricating-system efficiencies and on the general state of the art; B is the bore of the engine; and the expression $0.04545 B^3$ is an approximation for the average piston weights.

In Fig. 1, S_1 shows the relation of working speeds and bore, while M_1 is plotted between allowable maximum brake mean effective pressure taken at the speed of maximum torque.

From past experience it is obvious that small bore engines are much better power producers because they are much favored in both the matter of speed and mean effective pressure. Inasmuch as four-cylinder engines capable of pro-

ducing a maximum of 40 hp. can be equipped with small cylinders, it seems reasonable to feel that such an engine will be particularly well adapted for tractor service.

Combustion-Chamber Area

There is an important, though as yet undetermined, relation between the combustion-chamber wall area and its volume; this relation is a governing factor in determining the compression at which an engine can run satisfactorily. Compression and volumetric efficiency determine the mean effective pressure and influence economy favorably. The larger ratio of wall surface to volume in small bore engines makes the problem of cooling easy in the four-cylinder type. Piston heads of diameters up to 5 in. are not difficult to cool. Valves up to $2\frac{1}{8}$ in. clear diameter can be cooled satisfactorily, and inasmuch as 20 hp. can be developed per inch of valve diameter at the speed indicated by Curve S_2 , Fig. 1, we have another evidence of the advantage of the four-cylinder engine for tractor service.

Inertia forces, which vary roughly as the cube of the bore, have been found to be the principal cause of crankpin-bearing destruction. Our experience with thousands of tractor engines strongly corroborates this statement. In fact we design engines understanding that they will operate, not at the speed set by the governor, but at a slower speed of higher torque caused by the load being always greater than the engine can handle at governed speed. With the cooling properly taken care of our experience is that the length of the period between adjustments is a function of lubrication efficiency and the total number of revolutions. Having built an engine that will cool properly our test is to see how many million revolutions the engine can run between major adjustments. All things considered no other engine of ours has yet equaled the performance of a four-cylinder engine, which in service has run 420,000,000 revolutions with four adjustments of the connecting-rods and three adjustments of main bearings, finishing in good shape with the original valves, pistons, rings, bearings and crankshaft. This no doubt has been duplicated by other four-cylinder engines.

For the purpose of discussing four-cylinder, four-stroke cycle vertical engines from the standpoint of fuels, other than high grade gasoline, it is necessary to revert for the moment to the question of combustion-chamber walls. Because of the readiness and lower temperature at which the lower grades of fuel crack into higher and lower hydrocarbons the necessity for better control of maximum cylinder-

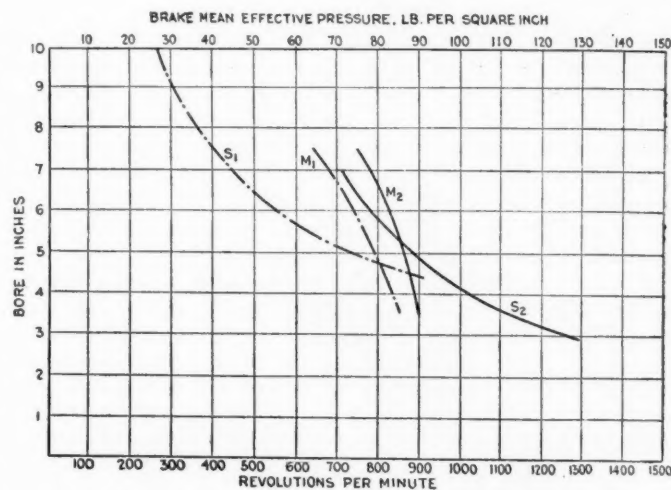


Fig. 1—Relation of cylinder bore to speed and mean effective pressure

S_1 —Curve of past experience in speed; S_2 —Curve of modern experience in speed; M_1 —Curve of past experience in mean effective pressure, and M_2 —Curve of modern experience in mean effective pressure.

wall temperatures points toward a range of bore and wall-area ratio to volumes that will give the best results through the automatic thermostatic effect of mere combustion-chamber dimensions.

Four-cylinder engines of either L-head or valve-in-head types fulfill these conditions between the cylinder bore sizes of $3\frac{1}{2}$ to 5 in., which correspond to the range of 16 to 40-hp. sizes demanded for tractor service. Above 5-in. bore engines tend to become "hot," and the cylinder wall is favorable for vaporization due to conducted and radiated heat given off at the slower speeds; below $3\frac{1}{2}$ -in. bore wall temperatures are too low, but great turbulence due to higher speed of the smaller engine helps to overcome the lower wall-temperature effects. The cylinder walls for burning kerosene should be as hot as possible without danger of a local high temperature sufficient to crack any part of the fuel. This usually occurs near the exhaust valve.

In working out the combined intake and exhaust manifolds that vaporize the fuels in the mixture during its passage to the cylinder the convenient proximity of the intakes and exhausts makes the L-head and valve-in-head types of cylinders the most frequently used. Tractor engines operate from 50 per cent to full load practically all the time and with comparatively small variation in speed. The four-cylinder, four-cycle engine is therefore easily applicable to burning kerosene, inasmuch as so far as vaporization is concerned the only difficult condition to be met is that which occurs when the engine is throttled.

Because of the narrower explosive-mixture range or air-to-fuel ratios, all of the above favorable factors combined to permit the practical burning of kerosene more easily in the four-cylinder than in any other type.

We have established an ultimate type of tractor engine when we say it shall be a four-cylinder four-stroke cycle vertical engine capable of delivering from 16 to 40 hp. continuously without showing distress at full or overload and of running at speeds varying between 750 and 1230 r.p.m. according to the bore. This engine should run, under favorable conditions, 40,000,000 revolutions between crankpin-bearing adjustments, 80,000,000 revolutions between adjustments of main bearings and 43,000,000 revolutions between grindings of valves.

Having decided upon a definite type, it may be well to enumerate the general elements of design that need the most attention.

1—A careful layout of the combustion-chamber in order to secure a high uniform temperature of the walls; this means no pockets for steam in the jacket, and a correct direction of cooling-water flow.

2—Valves arranged to secure favorable heat flow in the exhausts toward the water-jacketed seat and valve guide.

3—Piston head cooled so as to keep temperature of its center below cracking point of fuel.

4—Efficient circulation of water about the spark-plugs.

5—Pistons and rods of light weight.

6—Piston and rings with clearance so as to secure high-temperature performance at medium speed.

7—Stiff crankshaft of material of high elastic limit to withstand abrasion with ample main and crank bearings, particularly center main bearing.

8—Lubrication system designed to convey extraneous heat of piston lower cylinder wall, crankcase bearing webs and sides into a sump in which cooling means can be provided to dissipate such heat. The lubrication should be such that if any part fails, auxiliary systems are always at work to prevent sudden failure of bearings and great damage to the engines. The high bearing pressures and temperatures necessitate the use of medium and heavy oils. Breathers that prevent sand and dust from entering the engine should be used. When either the present gasoline or straight kerosene is burned, the increasing content of kerosene results

in a rapid drop in viscosity. The oil should therefore be renewed frequently.

9—Crankcase is best in design that is the stiffest and dissipates heat the best.

10—Heavy flywheels to meet sudden peak loads and thus relieve the crankpin bearings of the most severe pounding that they receive.

11—Air cleaners should be used to remove the dust and sand from the entering air.

12—A self-contained governor of both the maximum and constant-speed type is important.

Requirements for Kerosene Burning

13—Provision for burning kerosene. This involves the following considerations:

a—In tractor service when the load remains at over half the full value, kerosene gives reasonable satisfaction, provided properly proportioned combined intake and exhaust manifolds be used and the starting be made on gasoline.

b—Under such conditions the loss in volumetric efficiency due to heating the intake charge results usually in a decrease from 10 to 20 per cent in the maximum horsepower output, whether gasoline or kerosene is used.

c—When the engine speed increases, the necessity for heat in the intake is less, while when the speed decreases more heat is necessary in the intake. At full speed and power output, slight heating of intake will suffice.

d—A properly designed combustion chamber, removing the necessity of water injection, is required.

e—The principles of the science and art of burning kerosene, as indicated by my experience, are set forth in several papers by Dr. Charles E. Lucke, and the author testifies to the correctness of his conclusions.

f—A kerosene engine does not carbonize any more than does a gasoline engine; in fact, it stays cleaner than the gasoline engine if the fuel is only comparatively well vaporized.

g—When kerosene is well vaporized so that the mixture reaching the cylinder is in a dry state, a kerosene engine with a correctly designed combustion chamber will not be heated so much as will a gasoline engine.

h—In burning any grade of fuel the carbureter meters and atomizes the fuel; the manifold vaporizes the mixture; the combustion chamber burns it. Of all these the carbureter is the most nearly perfect. The manifolds are next in efficiency. The engines in their present form are the least able to perform their functions in attempting to burn kerosene. The development therefore of kerosene-burning in engines of the prevalent types should start with the engine and end with the carbureter.

There is no doubt that the greatest criticism of the four-cycle engine is its low thermal efficiency. The future certainly has great things in store for the improvement of this cycle. Perfected systems of spraying the fuel under pressure may offer great opportunities for improvement in the four-cycle as well as in the semi-Diesel type.

The use of heavy fuels is bringing to the front the wonderful possibilities of the newly-developed high-pressure steam boilers. The boiler has been the weak point in steam-driven vehicles but the modern high-pressure type, which delivers superheated steam at a pressure of from 800 to 1000 lb. per sq. in., taken together with the four-cylinder vertical single-acting poppet-valve type of uniflow engine is producing results in thermal efficiency that rival the average performance of the four-cycle internal-combustion engine—particularly when burning cheap oil. After all it is a serious matter to carry the fire box in the cylinder and also to keep the latter clean.

The determination of the ultimate type of tractor engine is really a problem needing the cooperation of engineer, salesman, consumer and manufacturer.

New Accessories Appearing at New York Show—II

Description of New Devices and Improvements in Established Accessories Continued from Last Week—New Things of Interest to Engineer, Manufacturer, Garageman and Car Owner

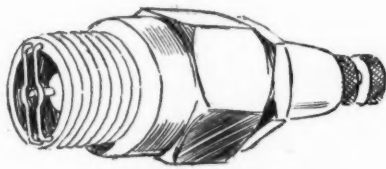
THERE were so many new accessories and so many instances where well known and established devices had been improved in design and construction brought out at the New York automobile show last week, that it was impossible to describe and illustrate them all in one issue. The descriptions are continued herewith:

Z-Ro-Hot Moto-Primer

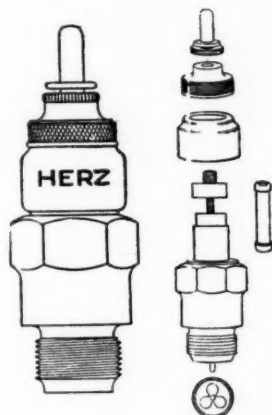
A tube connection between carbureter and manifold in conjunction with an electric heating coil and dash-operated valve form this device. When the valve is opened from the dash an electrical contact is made and the coil becomes heated. Cranking the engine draws gasoline from the carbureter through the heating coil so that it enters the cylinders in a partly vaporized state, rendering starting easy. The valve is then closed and the electrical current switched off. The device may be fitted to any car and sells for \$12.50.—Motor Engineering Co., Detroit.

Herz Bougie Mercedes

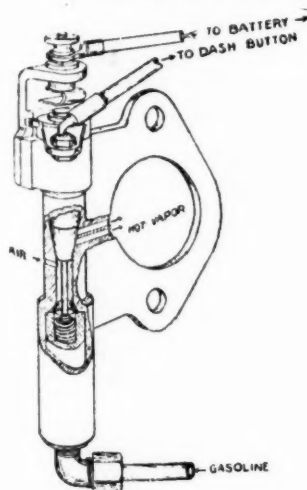
A newly-developed insulation, consisting of three parts, an inside stone, a mica cartridge and an outside stone, is a feature of this plug in the following threads, $\frac{3}{8}$ by 18 and $\frac{1}{2}$ -in. type only for types A, B, C, D, E, F, G, H and I. The inside stone is larger and has a large bore, permitting the introduction of the mica cartridge in which the hexagon headed inside screw is surrounded by India mica wound to a cylinder with each of the ends secured by a copper tip. The hexagon head of the screw fits into a recess in the lower part of the inside stone. The outside stone is large and further protects the two inside insulations. The top nut can be used as a thumb nut or with any terminal. The patented cloverleaf electrode is made of Herz platinum alloy and furnishes three



New Mosler spark plug



Herz Bougie Mercedes



Z-Ro-Hot Moto-Primer

spark gaps. The plug sells for \$1.50.—Herz & Co., New York.

New Kellogg Pumps

A new crankshaft drive pump for 1916 and 1917 Overlands and for 1917 Dodge and Chandler cars. This is attached to the shaft in the same manner as the starting crank, a pin serving to hold it in place when in use. At other times it is carried in the tool box. To prevent injury of the poppet intake valve this is in the piston. The lubricating is by oil-soap felt packing, so that no grease or oil is carried in the base. Metal rings insure good compression and it is impossible for oil to get into the air pumped to the tires. This pump sells for \$10, including air hose, gage, etc.

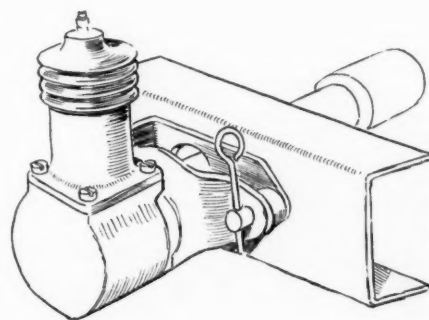
A feature of the Kellogg line of engine-driven tire pumps is model 101, which is designed for installation in most of the popular-priced cars with little machine work or fitting. The pump is all metal, having forged babbitt-line bearings, and the pistons are constructed to prevent oil leakage. Price, \$15, complete.—Kellogg Mfg. Co., Rochester, N. Y.

New Mosler Plug

This is the first time this plug has been exhibited at a show. The noticeable feature is that the insulator has a double hub or shoulder on it so that the nut which holds the insulator in place bears on the upper shoulder. Thus the pressure between this point and the lower shoulder is more evenly distributed and there is less danger of breaking the insulator. Price, \$1. It is guaranteed to outlast the motor.—A. R. Mosler & Co., Mount Vernon, N. Y.

Lane Bros. Jack

A 36-in. extension handle raises or lowers the car without the driver getting under it. In construction the jack proper is similar to the standard Lane jack, the feature being this extension handle by which the jack is controlled. To raise the car the handle is pushed all the way into the socket; to lower it is only necessary to pull it towards the operator. The jack is made in four sizes, No. 14, 10 to 16 $\frac{1}{2}$ in. lift, 1800 lb. capacity, for \$3.50; No. 15, 11 $\frac{1}{2}$ to 19 $\frac{1}{4}$ in. lift, 1800 lb. capacity, \$3.75; No. 16, 10 $\frac{1}{4}$ to 16 $\frac{1}{2}$ in. lift, 3000 lb. capacity, \$4.75; No. 17, 11 $\frac{3}{4}$ to 19 $\frac{1}{2}$ in. lift, 3000



Kellogg crankshaft drive tire pump

lb. capacity, \$5.—Lane Bros. Co., Poughkeepsie, N. Y.

N. Y. Coil Co. Devices

At the booth of the New York Coil Co. is a new safety steering device for Fords, which consists of a bearing with projecting sides bolted to the steering column at an angle so that the projection at one side is below the supporting rod, the other end being above the corresponding rod on the opposite side. Price, \$1; also the Thermo-Electric primer, comprising a heating coil which surrounds a connection between the gasoline supply from pipe, bottom of carburetor or vacuum tank, and is screwed into the intake pipe, where it is operated by a small lever on the instrument board. The primer costs \$5 and fits any car.

This completely new system features extreme flexibility and high efficiency. It is asserted that the car may be throttled down to a walk, and then accelerated to full speed without skipping or jerking. It is operated by six dry cells, which supply sufficient current for 2000 to 4000 miles' running, leaving the Ford magneto to furnish lighting current exclusively. The system comprises a non-vibrating transformer coil, which is capable of producing an intense spark needed for the ignition of low-grade gasoline, and a combined breaker and distributor mounted on the standard Ford timing shaft, but in a vertical position. Price, \$20.—New York Coil Co., New York.

J-T Windshield Cleaner

The J. T. windshield cleaner is rust-proof, enameled in black and does not interfere with top, curtains or windshield supports, being mounted on the windshield directly in front of the driver so that the rubber wipes the glass clean and dry, affording a clear view. The cleaner sells for \$2, attached, and is made by the J. T. Auto Devices, Cleveland.

The Handy cigar lighter has a heating coil, and pressing the button sends cur-

rent through resistance wires, making them almost white-hot. A draught circulates through the device when not in use. No. 1 lighter sets flush with woodwork or trimming, No. 2 attaches in any position without cutting into the car, and No. 3, a non-reel type, has a spring bracket. The reel types are automatically rewound when released after using. When wound all current is cut off. No. 1 and No. 2 lighter, \$6; No. 3, \$2.50.—A. J. Picard & Co., New York.

Perfection Heater for V-Engine Cars

Perfection heater models are now made also for Cadillac eights and Packard twin sixes. There is an inlet at each end to take care of the exhaust gas from each type and an outlet in the center. The Cadillac type, with oxidized brass housing ready to install, sells for \$32.50. For a floor type heater the standard type A can be connected to each exhaust pipe, this outfit costing \$31. In the Cadillac Victoria the type A should be connected to the right hand exhaust pipe only; price, \$25.—Perfection Spring Service Co., Cleveland.

Petry Cut-Out for Fords

A new Petry cutout for Fords which sells for \$3 complete with pedal and chain is shown at the Petry exhibit. This differs from the standard model only in the shape of the lever, which is changed to facilitate mounting on the Ford. No adjustment is required on the lever. The Petry company has also prepared a very complete list of cars alphabetically arranged in 1914, 1915 and 1916 models, with the size of cutout required for each. The Anthony single-acting single-cylinder hand tire pump is also

exhibited. Price, \$4.—N. A. Petry Co., Philadelphia.

Pittsburgh Parabolite Spotlight

A 7-in. spotlight with brackets for attachment to any car and incorporating a Cutler-Hammer switch in the handle, features a 6-in. patented Parabolite main reflector of brass with a heavy silver finish, which directs the light rays in a parallel beam. A simple and positive focusing attachment is provided whereby the rays may be concentrated at any desired point, and the 4-in. diminishing mirror attached to the side of the lamp enables the driver to see to the rear. Price, \$7.50.—Pittsburgh Electric Specialties Co., Pittsburgh.

Parker Rust Proofing

A highly adhesive rustproof process, preventing scaling or peeling, is being featured by the Parker company, which is exhibiting various articles treated with its product. The Parker process makes an absolute base for japan, enamel or paint and increases their life and appearance.—Parker Rust-Proof Co. of America, Detroit.

Plunkett Electric Gasometer

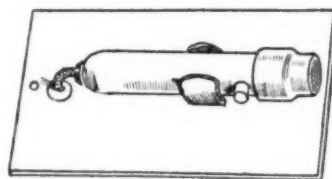
The Plunkett device, which is on exhibition in the salon at the Hotel Astor, has an indicator for mounting on the dash to show the amount of gasoline in the fuel tank and which throws on a warning light when the supply has dropped to 4 gal. There are three parts—a float, which progressively makes and breaks an electric circuit as the fuel level changes; a dash-mounted indicator having small electric lights behind numbers cut in the dial, and a single dry cell with wiring connecting the other two units. Pressing a button on the dash



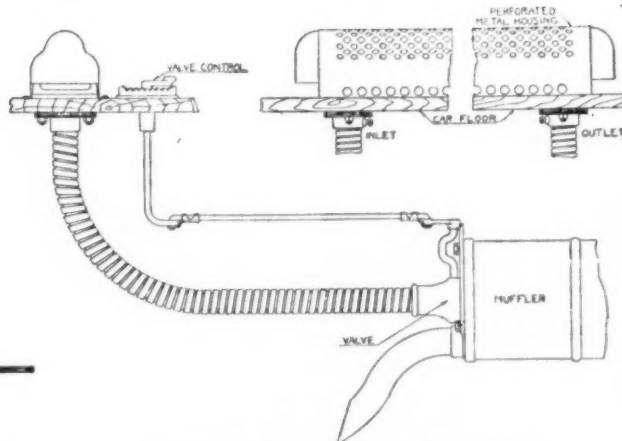
Pittsburgh Parabolite spotlight



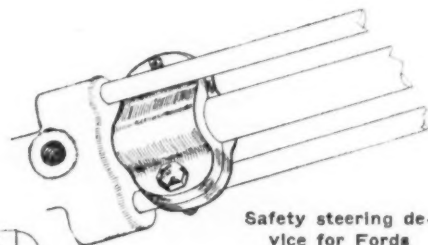
Lane Bros. extension jack



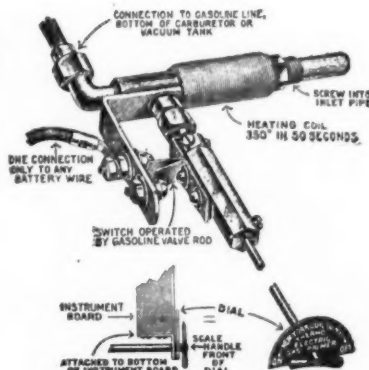
Handy cigar lighter



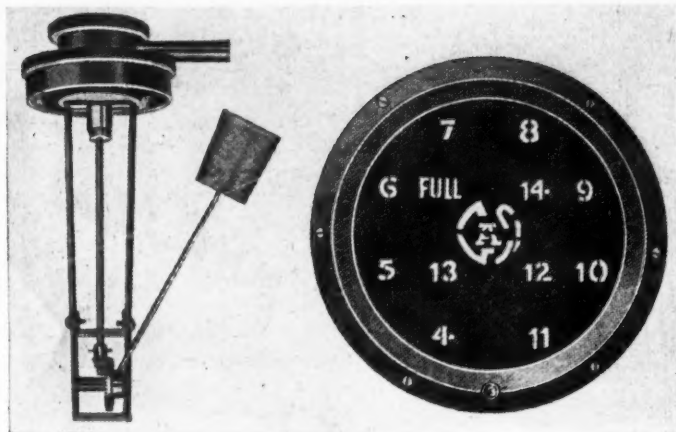
Illustrating Perfection heater operation



Safety steering device for Fords



Thermo-Electric primer



Plunkett electric Gasometer fuel indicator

meter illuminates the number showing the amount of fuel in the tank. The automatic warning light is in the center. The Gasometer fits any car and sells for \$15.—Plunkett Electric Gasometer, New York.

Sparton Vacuum Feed

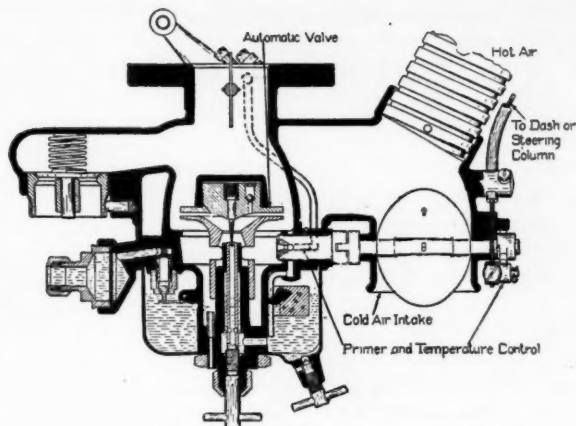
That it is the smallest, simplest and most efficient vacuum tank are the claims made for the Sparton device. The tank holds about 1 qt. It is divided into two chambers, the upper one being suction and the lower, discharge. The upper chamber is connected to the manifold and to the gasoline tank and a float operates the valves. Flow to the lower chamber is continuous through a flap valve and gasoline in the lower chamber is maintained at a constant level in it. It is said that the tank cannot be drained under high speed with throttle wide open and that 5 sec. of cranking is sufficient to fill the tank when it is empty. The vent to the upper chamber is connected to the lower one by a small pipe, so that there is no danger of gasoline splashing out when the upper chamber is full.—Sparks-Withington Co., Jackson, Mich.

New Shakespeare Controls

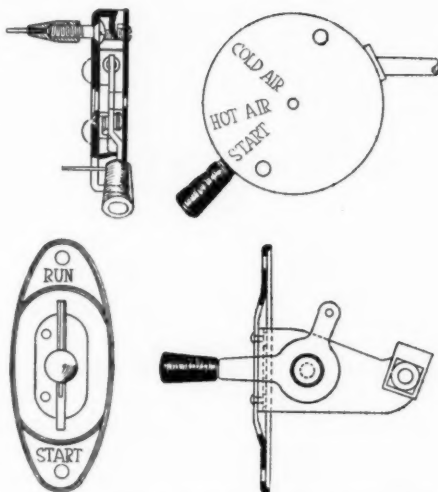
To meet the S. A. E. standard 1 1/16-in. throw for carburetor controls, the Shakespeare Co. has brought out controls to this dimension for both dash and steering wheel mounting and has found a large demand for these new products. An improvement has also been made in the Shakespeare automatic carburetor in that it now incorporates a patented primer consisting of a tube leading from the mixing chamber to a point above the throttle, so that the primer functions separately, delivering a gargled mixture of fuel and air directly into the manifold, which greatly facilitates starting, especially in cold weather.—Shakespeare Co., Kalamazoo, Mich.

Victor Heater for Fords

The Victor heater may be applied to a Ford in 30 min., requiring no change in the car and no special skill for fitting.



Shakespeare carburetor, showing primer



Shakespeare 1 1/16-in. throw carburetor controls

It is operated by the exhaust gases and consists of a metal box with a radiator at the top, which takes the place of one of the floorboards, the heater being supplied complete with a section of floorboard. The only cutting necessary is a V-shaped aperture in the exhaust pipe, over which the heater pipe is clamped. The device, which costs \$5, is manufactured by the Victor Heater Co., Camden, N. J.—W. E. Pruden Hardware Co., New York.

Shaler Vulcanizers

The Five-Minute vulcanizer is a new Shaler design for mending tubes, in which heat is produced by burning a chemically treated disk about the size of a silver dollar. Each of the twelve

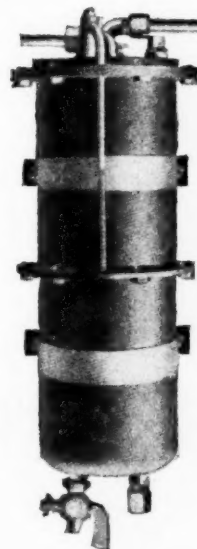


Shaler Five-Minute vulcanizer

patches furnished with the outfit is complete in itself consisting of the patent heat unit in its metal container and the patch of raw rubber to be patched to the surface of the container. The complete container is clamped over the puncture and the heat unit is lighted. In 5 min. the repair is done and there is no danger of overcuring. Anyone can do the work. Price, \$1.50; extra patches and heat units, 75 cents.

A complete steam vulcanizing plant with capacity for two cases and five tubes is a new design which resembles a continued model except that there is provision for two casings instead of one. It may be had either with gas or gasoline burner or both. Price, \$85.

A bench tube vulcanizer with capacity for four tubes and operated by steam in connection with a gas or a gasoline burner, is a new model. Steam may be



Sparton vacuum fuel feed tank which incorporates two chambers, the upper for suction and the lower for discharge. Only 5 sec. of cranking is required to fill the tank when empty



Victor heater for Fords

raised in 15 min. and is maintained at the proper pressure by thermostatic control. It is equipped with steam gage and safety valve. Price, \$25.—C. A. Shaler Co., Waupun, Wis.

New Schrader Tire Valve

The new Schrader inflating valve is smaller and is rubber covered. It resembles a spool except that there is a connection at one side for the air hose. In spite of the reduction in size the air passage has been enlarged to give quicker inflation and the substitution of conical washers in place of flat washers removes all possibility of air leakage.—A. Schrader's Sons, Brooklyn, N. Y.

Spray Primer

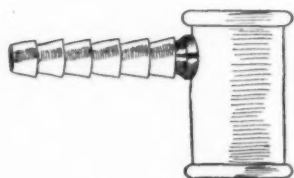
The Spray primer is a small injector pump with the operating button attached to the inside of the dash or floor board drawing gasoline from the supply line and forcing it into the intake manifold. It may be attached in less than 1 hr. and requires no soldering. Price, \$7.50.—Spray Primer Co., 11 Pemberton Square, Boston.

New Splitdorf Ford Plug

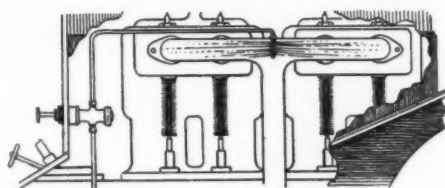
The plug made for Ford cars has been changed in many particulars. A fish-hook electrode is now used and the interior construction has been improved. A new plug designed for tractor work,



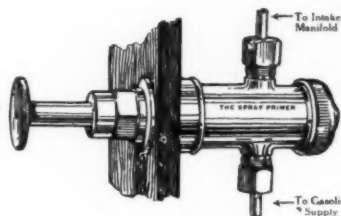
Twin New Era shock absorber



New Schrader tire valve



Spray primer mounting on engine



Detail of Spray primer dash mounting



A new Splitdorf plug for Fords

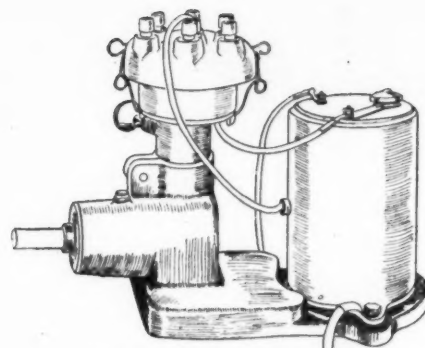
but which may also be usable for standard pleasure engines, is known as the heavy Hex model. Its feature is that it is a very heavy hexagon by which it may be screwed in very tight into the cylinder. A combination voltmeter and ammeter designed for flush mounting on the cowl has been added. It shows charge or discharge in amperes, and by pressing a button at one side, the voltage is registered.—Splitdorf Electrical Co., Newark, N. J.

Stentor Autophones

The Stentor is a complete and distinctive line of autophones with mechanical construction practically the same throughout, an electrical device permitting the occupant of the rear compartment of the enclosed car to direct the driver. The autophones may be had in practically any desired design or finish. One set, the No. 9, has transmitter of sterling silver decorated in enamel to match the upholstery of the car and carries a mirror on the reverse side. Prices range from \$25 up.—Stentor Electric Mfg. Co., Inc., New York.

New Stevens Devices

In addition to their line of reamers and other tools for Fords and other makes of cars, Stevens & Co., New York, are showing some new devices, noteworthy among which are a running board mat, price \$2, made of transverse rods covered with leather rings with each rod linked to the next by a series of leather strips; and the Ever-Right gasoline gage for Ford cars. This gage comprises a shallacked cork float secured to a metal bobber, notched to indicate the amount of gasoline in the



New Splitdorf magneto mounting



Ever-Right gasoline gage for Fords

Left—Stentor Auto-
phone

tank. Price, \$1.—Manufactured by Ever-Right Products Corp., New York City.

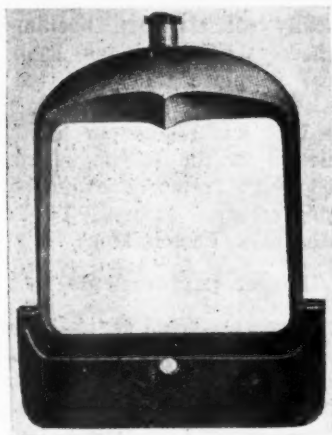
A Twin New Era

The main improvement in this absorber is the addition of a new radius link that takes care of side sway and permits a freedom of action formerly impossible on elliptic absorbers. Attached to the upper end of shock absorber plungers are pivoted links which are attached to the frame of the absorber. Price of twin elliptic absorber for a 2300-lb. car is \$12 for the rear spring set; for a 2300 to 3000-lb. car, \$12.50; for 3000 to 3800-lb. car, \$13.50, and for a car over 3800 lb., \$15.—New Era Spring & Specialty Co., Detroit.

New Wagner-Hoyt Units

The Wagner-Hoyt company exhibited a complete line of electrical equipments, including motors, generators, battery and magneto ignition units. In the generator line there are four types. These are all Ward-Leonard instruments weighing respectively 10, 15, 18 and 24 lb. and having capacities of 8 amperes for the 10-lb. instrument and 10 amperes for the others. The Ward-Leonard system of control is used with each.

Two types of starting motors are manufactured, both being four-pole



Superior radiator shell for 1917 Fords

series-wound units and are built for both 12-volt and 6-volt systems.

The W-H battery ignition set consists of an interrupter, spark coil and condenser, distributor and switch. A feature of the breaker mechanism which is a simple cam-operated type, is that it is lubricated by a felt roller which keeps the internal friction at a minimum.

The magnetos are made in two styles, the W-H and the Volta. The W-H is a two-spark per revolution type of high tension instrument with the distributor self-contained. The Volta is a distinctive type with waterproof qualities.

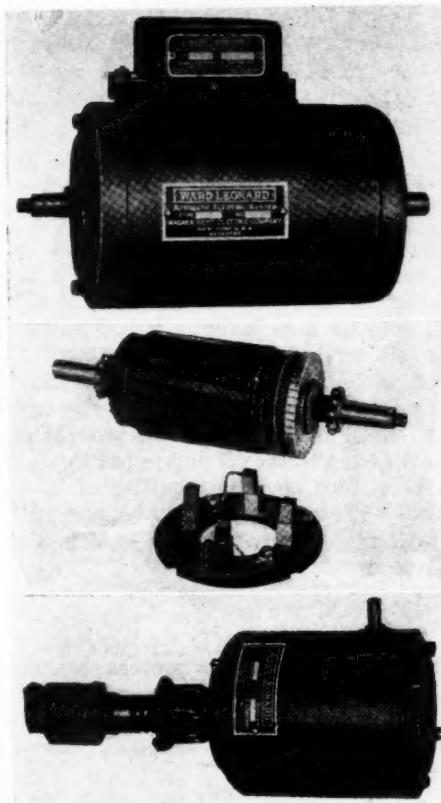
Thin plate batteries for use with the ignition starting and lighting systems are shown, together with a line of switches, meters, cables, etc.—Wagner-Hoyt Electric Co., New York.

Superior Line Larger

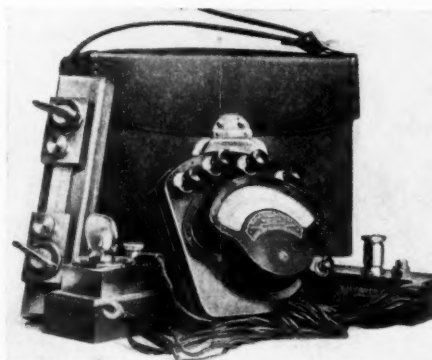
New things in the Superior line comprise a radiator shell for 1917 Fords, wire wheels for Ford cars with demountable rims and numerous other products. The radiator shell has an apron attached covering the Ford front axle, the shell having a V tapering top, designed to give an elegant effect when slipped over the radiator. The regulator hood is retained. Price, in black finish, \$8; nickel finish, \$10.50. The wire wheels with demountable rims are furnished complete with ball cups, dust caps, wrench, nuts, etc., the right front hub being arranged for speedometer gear and the rear hubs with brake drums, etc. Use of demountable rims obviates possibility of spokes working through the rims and pinching the inner tubes. A set of four wheels complete with rims weighs 130 lb. There is one extra demountable rim included in the price of \$40. The wheels are finished in black baked japan with nickel-plated caps. The Superior company is also showing a large line of various types of custom made brass and nickel lamps for special body work in addition to its regular line of automobile lamps. The line also includes special products for Ford cars, such as radiators, stream line



Superior wire wheel for Fords, with demountable rim



New Wagner-Hoyt electrical units. At the top is a generator with regulator, in the center an armature with brush assembly and at the bottom is a starting motor



Weston electric outfit for testing electrical systems

hoods, windshields, crowned fenders, running boards, etc.—Superior Lamp Mfg. Co., New York.

Wilson Tire Holder

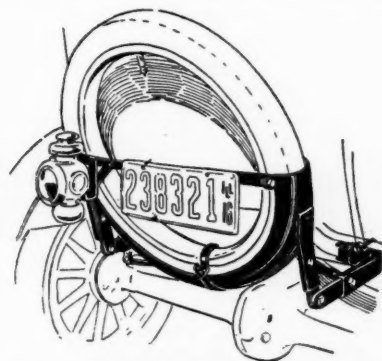
This rear tire carrier for Fords is secured to the rear crossbar by means of two U-bolts and tie-plates. The latter grooved to provide a positive lock on the channel steel side bars, without cutting or drilling the car frame. The lamp bracket and license carrier are integral with the tire carrier and are also adjustable and by means of a snap lock the tire may be padlocked in place on the rack. Price, \$5.—P. W. Stewart, Chicago.

Hoskyns Tops

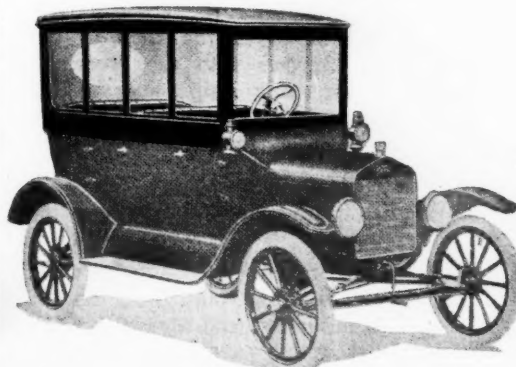
A number of detailed improvements feature these detachable tops for Fords, Maxwell, Chevrolet and other popular priced cars. The rear and lower side sections are pressed out in oil and take a very fine paint finish, also they are waterproof, light and durable. Windshield and windows are plate glass and the windows are removable. Price for Ford touring car, \$125; Ford roadster, \$110; Overland country club, \$135; Chevrolet roadster, \$110, and other cars in proportion.—Universal Motor Products Co., Indianapolis.

Weston Electrical Devices

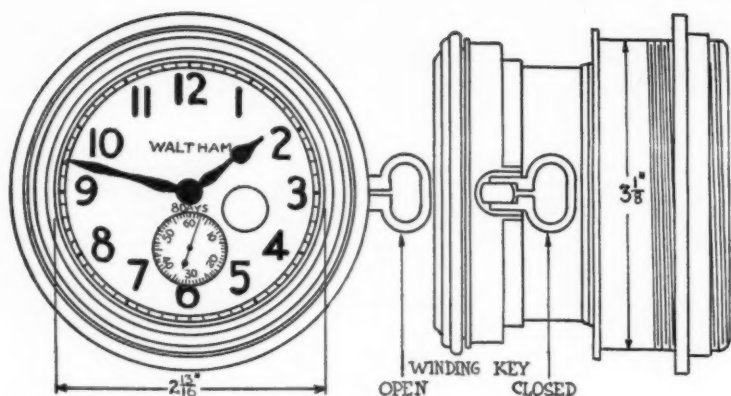
The Weston electrical testing set for the garage, designed to locate all troubles of electric starting and lighting systems, consists of a voltmeter, milli-volt meter, ammeter, milli-ammeter, and voltmeter,



Wilson combination tire, lamp and license plate holder for Fords



Hoskyns demountable tops are made for most popular-priced cars



New Waltham telescopic clock of double telescopic cowlboard design. It is about twice as thin as the model brought out over a year ago

together with all shunts and connections necessary for the testing work, packed in a pocket size leather case convenient for road work. The use of the instrument is varied, some of them being determination to run down batteries, short circuits or grounds, defective lamp sockets, open circuits, brush troubles in the motor or generator, etc. A full description of the method of making connections for the various uses are included with the instrument. Price of model 280 is \$22.50.—Weston Electrical Instrument Co., Newark, N. J.

New Waltham Model

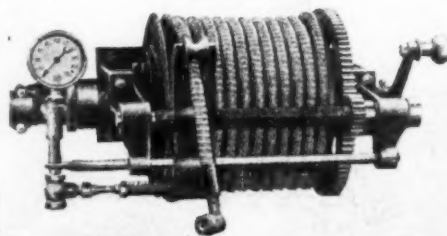
A new flush type Waltham speedometer with black or silver dial, 1000-mile trip and 100,000-mile season odometers is shown which has an especially quick reset. A knurled knob is turned to set the trip figures back, and when it is desired to do this quickly, holding down a small button gears up the drive ten times, so that when the knob is turned the figures are set back ten times as fast as ordinarily. The telescopic clock which was brought out over a year ago is now a double telescopic design and consequently is about twice as thin as formerly. The clock is a cowlboard design which is particularly neat.—Waltham Watch Co., Waltham, Mass.

Boyce Moto-Meter Emblems

A large selection of emblems is offered at no extra charge to purchasers of the largest Boyce Moto-Meter. These emblems include car name plates, club insignia, fraternal emblems and initial dials. A special Overland design has been added in which the stem of the Moto-Meter screws into the Overland radiator cap. This design may be had in all three Moto-Meter models.—The Moto-Meter Co., Long Island City, N. Y.

An Air Hose Reel

Two new accessories especially valuable to garagemen are: An automatic hose reel for wall or post mounting comprising a drum for winding up the air hose when not in use and thus keeping it out of dirt and grease and free from kinks and other damage, and with a pressure gage attached. The reel is

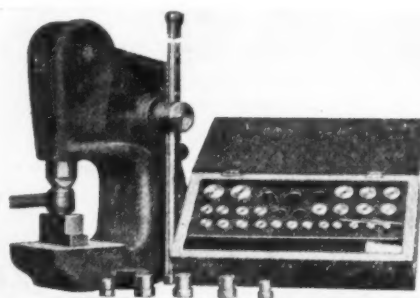


United Engine & Mfg. Co. hose reel

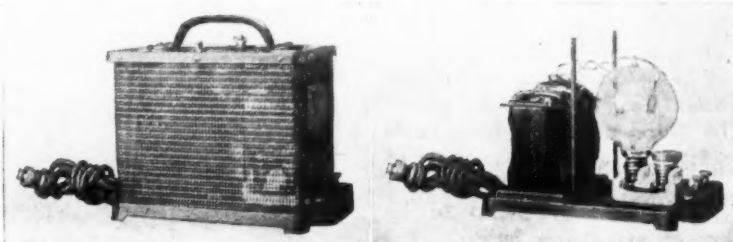
easily operated and cannot get out of order, automatically shutting off the air when the hose is not in use. It may also be used for hose in filling radiators, etc.; an oil service cart containing three 12 gal. tanks for light, medium and heavy oils renders supplying oil to a car easy and clean as the cart can be brought up to the car and the oil pumps out through a hose, thus obviating spilling of lubricant. These carts are also made with two tanks.—United Engine & Mfg. Co., Hanover, Pa.

Beach Bushing Press

Replacing bushings is rendered unnecessary when the Beach process bushing press is used. A small press and swedges



Beach process bushing press



Westinghouse charger, type WI, designed for charging small batteries

in all sizes from 7/16 to 1 3/16 in. to fit practically all standard bushings are furnished. When bushings have been swedged in place they may be again reamed to fit. Six connecting-rods may be swedged and reamed in 1/2 hr., and the metals in the bushings are finer grained than formerly owing to the swedging process. Price \$100 f.o.b. Boston.—Greb Co., Boston, Mass.

Sager Bumper Improvements

The Sager combined channel and diamond section bumper is fastened to the frame brackets in a new way. The arm carrying the bumper has a pointed screw which goes through the bottom flange of the channel and the point engages the upper flange. The whole is held tight by a lock nut.—J. H. Sager Co., Rochester, N. Y.

Small Westinghouse Charger

Type WI is a charger designed for charging small batteries of from one to six lead cells or up to ten Edison cells such as those used for starting, lighting and ignition. It is intended for the small garageman or the car owner. The rectifier bulb and transformer are mounted on a small cast-iron frame with a perforated sheet-iron cover. The outfit delivers a practically constant current of approximately 5 amp. throughout a complete charge to any battery within the limits of the cell range. Starting is accomplished by shaking the outfit. It is designed for 110 volts and transforms the current to 2 to 15 volts d.c. List price, \$25.—Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Mattson Additions

A new heat and cold deflector for Fords, consisting of a rubber pad with a soft closing feature for the pedals, Holdfast fabric back repair outfit for repairing inner tubes and pedal pads for Cadillac, Hupmobile and Saxon cars are new features at the booth of the Mattson Rubber Co., Lodi, N. J.

Sipp Drill Presses

In Sipp quick-change-speed sensitive drill presses a new feature is evident at the show this year in a regulation of power feed to the spindle. A capstan wheel when pulled down by hand automatically throws on the power feed and

as soon as the drill passes through the work the mechanism automatically returns to its original position. A feature of the exhibit is a machine for drilling four-speed oil holes in crankshaft and equipped with a universal table which can be tipped to any angle, the entire outfit swinging around a column.—Sipp Machine Co., Paterson, N. J.

Prest-O-Lite Lead Burner

The new lead burning outfit which is designed particularly for storage battery work is of interest to repair men. It consists of an oxy-acetylene torch which is modified to give best results with this work.—Prest-O-Lite Co., Indianapolis.

New Pratt Products

A wire mat for running boards with spring hook attachment to make removal easy for cleaning, etc., and selling at 75 cents, is one of the new things at the Pratt exhibit. There is also a Mud Puller jack, a combination of a pulling device and an ordinary jack. Price, \$2.50. A movable step jack is also shown, enabling the operator to meet all sorts of conditions, such as rough road surfaces, flat tire, car sinking in mud,

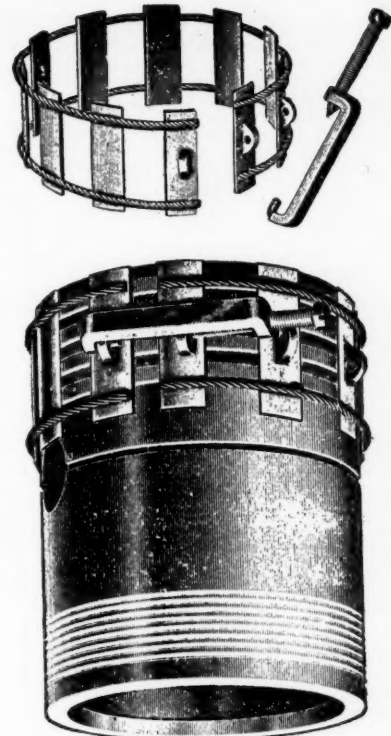
etc. Price, \$2.50. This jack is made in all sizes from 8 in. up.—William E. Pratt Mfg. Co., Chicago.

A Ring Compressor

Pistons may be easily inserted in the cylinder by the aid of this ring compressor. It consists of a series of steel clamps, held together by two steel cables inserted in the piston. These are placed around the rings and contracted by means of a hook and screw, which force the rings into their grooves. Price, pistons 2 to 4 in. diameter, 80 cents.—S. W. Merritt Co., New York.

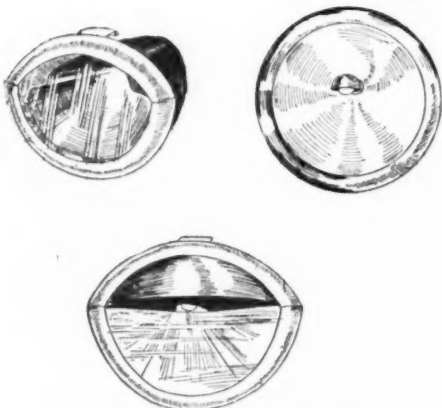
Lightning Cleanser

The cleanser is an oily liquid which is said to dissolve mud, oil grease and dust and may be used in place of soap and water in cleaning the car. When it dries, it forms a thin hard coat of a wax-like substance on the surface, preserving the finish from the elements, it is said. The cleanser is applied with a saturated piece of cloth, sponge or piece of waste, after which the body should be wiped dry and polished. Price, \$1.50 per ½ gal.—Lightning Cleanser Mfg. Co., Perin Bldg., Cincinnati, Ohio.



Merritt piston ring compressor

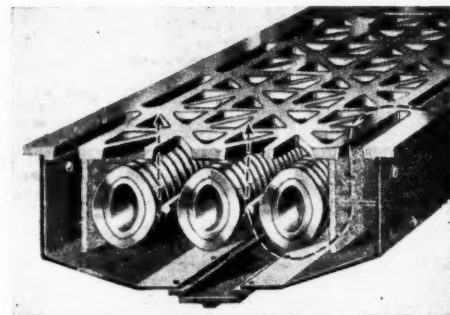
Some Accessories at the New York Show Described Last Week, But Not Illustrated



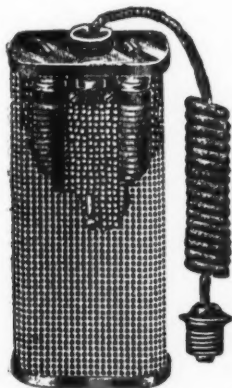
Heinze headlight reflectors



Grossman EverGood splash pan channel bumper



Autocraft-Bovey heater which the driver can control from the seat



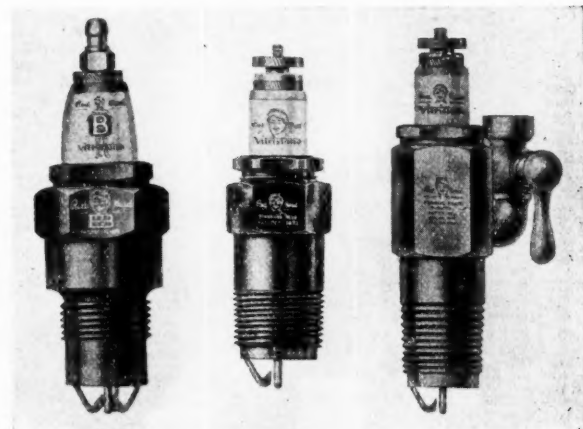
Presto electric engine anti-freeze heater



Autocraft steel ball spark plug



A-C Titan 7/8-in. racing plug



Grossman Red Head spark plugs with the new Vitri-stone insulation. Left—7/8-in. Big Boy. Center—1/2-in. standard. Right—1/2-in. priming plug

Industrial Miscellany

Personals

S. Christensen has been appointed as special sales representative of the Motor Products Corp., Detroit. Mr. Christensen was formerly traveling representative of the Vanguard Mfg. Co., one of the five companies now incorporated in the Motor Products Corp.

John McAvoy, formerly of the American Top Co., will associate with several Jackson, Mich., citizens and form a company for the purpose of making motor car tops and accessories. It is planned to lease the plant of the Standard Mfg. Co. at Jackson for manufacturing purposes.

W. H. Varley, who was manager of the Hudson Motor Car Co. branch at

Newark, N. J., has joined his former chief, E. C. Morse, now vice-president and general manager of the Chalmers Motor Co., Detroit, and will travel.

J. A. Bower, organizer and vice-president of the Bankers' Community Corp., Detroit, which promotes sales of automobiles, has been elected vice-president of the Liberty National Bank, New York. He retains his other interests.

Fred Hill, factory representative of the Willys-Overland Co., Toledo, has resigned to act as retail sales manager for the Paige Motor Sales Co., Seattle.

J. R. Gemmrl, formerly sales manager for the Kansas City branch of the B. F. Goodrich Co., has been appointed to take charge of the Chicago branch of the Pennsylvania Rubber Co.

Roy Sheen has been appointed manager of the Portland branch of the wholesale accessory house of Hughson & Merton, succeeding E. O. Johnstone, who has resigned to become a member of the sales organization of the Weed Tire Chain Co.

Richard Taylor has been made branch manager for the Zenith Carburetor Co., Chicago. Mr. Taylor was formerly connected with the General Motors Co.

W. D. Young, who has been the Southern field representative for the Packard Motor Car Co., has been awarded the Packard agency for Birmingham, Ala.

W. D. Smith has been appointed sales manager of the California Tire & Rubber Co., 597 Golden Gate Avenue, San Francisco.

The Automobile Calendar

ASSOCIATIONS

Jan. 24-26 — Chicago, Second Annual Meeting National Assn. of Automobile Accessory Jobbers. Congress Hotel.

CONTESTS 1917

April—Los Angeles to Salt Lake City Road Race.
May 19—New York Metropolitan Race on Sheepshead Bay Speedway.
May 30—Indianapolis Speedway Race, Championship.
June 9—Chicago, Ill., Speedway Race, Championship.
June 23 — Cincinnati, Ohio, Speedway Race.
July 4—Omaha, Neb., Speedway Race, Championship.
July 4—Tacoma, Wash., Speedway Race, Championship.
July 14 — Des Moines, Iowa, Speedway Race, Championship.
Aug. 4—Kansas City Speedway Race.
Sept. 3—Cincinnati, Ohio, Speedway Race, Championship.
Sept. 15 — Providence, R. I., Speedway Race, Championship.
Sept. 29—New York, Speedway Race, Championship.
Oct. 6—Kansas City Speedway Race.
Oct. 13 — Chicago, Speedway Race.
Oct. 27—New York Speedway Race.

SHOWS

Jan. 12-20—Philadelphia, Show, Philadelphia Automobile Trade Assn.
Jan. 15-20—Fall River, Mass., Show, Casino.
Jan. 17-19 — Milwaukee, Wis., Union Storage Bldg., King Street, Dealers' Assn.
Jan. 20-27 — Montreal, Que., Almy Bldg., Automobile Trade Assn.
Jan. 20-27—Detroit, Mich., 16th Annual Show, Detroit Automobile Dealers' Assn.
Jan. 22-27—Rochester, N. Y., Show, Exposition Park, Rochester Auto Trades Assn.
Jan. 22-27—Manchester, N. H., Academy.
Jan. 22-27 — Buffalo, N. Y., Show, Broadway Auditorium, Buffalo Automobile Dealers' Assn.

Jan. 22-27—Scranton, Pa., Board of Trade Bldg., H. B. Andrews, Mgr.

Jan. 23-27—New Bedford, Mass., State Armory, Stephen W. Pierce, Mgr.

Jan. 23-27 — Oklahoma City, Okla., Show, Auditorium.

Jan. 23-27 — Baltimore, Md., Show, Fifth Regiment Armory.

Jan. 24-27—Lewiston, Pa., First Annual.

Jan. 24-29—Charleston, W. Va., Armory.

Jan. 25-27—Asheville, N. C., Show, Asheville Automobile Trade Assn.

Jan. 27-Feb. 3—Richmond, Va., First Annual, Gray's Armory.

Jan. 27-Feb. 3—Columbus, O., Show, Memorial Hall, Columbus Dealers' Assn.

Jan. 27-Feb. 3, 1917—Chicago, Ill., Show, Coliseum, National Automobile Chamber of Commerce.

Jan. 27-Feb. 3—Portland, Ore., Eighth Annual, Dealers' Motor Car Assn. of Oregon.

Jan. 27-Feb. 5 — York, Pa., Show, York Automobile Dealers' Assn.

Jan. 28-Feb. 3 — Wilmington, Del., Show, Hotel duPont.

Jan. 29-30—London, Ont., Victor Carty, Mgr.

Feb. 3-10—Minneapolis, Minn., Show, Minneapolis Automobile Trade Assn.

Feb. 5-9—Boston, 8th National Good Roads Show, Mechanics' Bldg.

Feb. 5-10—Indianapolis, E. W. Steinhart Bldg., Indianapolis Automobile Trade Assn.

Feb. 5-10—Bangor, Me., Bangor Automobile Assn., Auditorium.

Feb. 5-10—Indianapolis, Ind., Indianapolis Automobile Trade Assn., Steinhart Bldg.

Feb. 7-10 — Bay City, Mich., Automobile and Accessories, Armory, F. D. Shaver, Mgr.

Feb. 7-11 — Kalamazoo, Mich., State Armory, Kalamazoo Automobile Dealers' Assn.

Feb. 8-15—First Pan-American Aeronautic Exposition, New York City; Aero Club of America, American Society of Aeronautic Engineers, Pan-American Aeronautic Federations.

Feb. 10-17 — Harrisburg, Pa., Harrisburg Automobile Dealers' Assn., J. Clyde Myton, Mgr.

Feb. 10-17 — Hartford, Conn., Show, State Armory, First Infantry.

Feb. 10-18—San Francisco, Cal., Pacific Automobile Show, G. A. Wahlgreen, Mgr.

Feb. 12-17 — Bay City, Mich., Show, Armory.

Feb. 12-17 — Louisville, Ky., Show, First Regiment Armory, Louisville Automobile Dealers' Assn.

Feb. 12-17—Toledo, O., V. G. Kibby, 1017 Jefferson Ave.

Feb. 12-19 — Indianapolis, Ind., Show, Steinhart Bldg., Indianapolis Automobile Trade Assn.

Feb. 13-15—Grand Forks, N. D., Auditorium, Automobile Dealers' Assn.

Feb. 13-17 — Williamsport, Pa., Armory, John Kelly, Mgr.

Feb. 14-17—Peoria, Ill., Coliseum, Automobile and Accessory Dealers' Assn.

Feb. 15-17—Racine, Wis., Chas. A. Myers, Mgr.

Feb. 17-24—Albany, N. Y., Sixth Annual, State Armory, Albany Automobile Dealers' Assn.

Feb. 17-24 — Newark, N. J., Show, First Regiment Armory.

Feb. 18-25 — St. Louis, Mo., Show, Automobile Manufacturers' and Dealers' Assn.

Feb. 19-24 — Springfield, Ohio, Show, Memorial Hall, Springfield Automobile Trade Assn.

Feb. 19 — Pittsfield, Mass., Show, Armory, J. J. Callahan, Mgr.

Feb. 19-24—Portland, Me., Exposition Building.

Feb. 19-24 — Grand Rapids, Mich., Show, Automobile Business Assn. of Grand Rapids.

Feb. 19-24 — Duluth, Minn., Show, Duluth Auto Dealers' Assn., Armory.

Feb. 19-24 — South Bethlehem, Pa., Show, Coliseum.

Feb. 19-24—Bridgeport, Conn., Show, Armory, Coast Artillery Corps.

Feb. 19-24—St. Louis, Overland Bldg., St. Louis, Auto Dealers' Assn.

Feb. 19-24—Syracuse, N. Y., Show, State Armory, Syracuse Dealers' Assn.

Feb. 19-24—Pittsfield, Mass., J. J. Callahan, Mgr.

Feb. 21-24—Flint, Mich., Coliseum, Lake Side Park, E. W. Jeffers, Mgr.

Feb. 24-March 3 — Brooklyn, Show, 23rd Regiment Armory.

Feb. 24-March 3—Atlanta, Ga., Automobile Dealers' Assn., Auditorium.

Feb. 26-March 3—Omaha, Neb., Show, Auditorium, Omaha Automobile Show Assn.

Feb. 26-March 3—Utica, N. Y., Utica Automobile Dealers' Assn., State Armory.

Feb. 26-March 3—Wilkes-Barre, Pa., Hugh B. Andrews, Mgr.

Feb. 27-March 4—Atlanta, Ga., Show, Auditorium, Atlanta Auto Trades and Accessory Assn.

March 1, 2, 3 — Urbana, Ill., Show, Automobile Trade Assn. of Champaign Co., Armory of the University of Ill.

March 3-10 — Boston, Mass., Show, Mechanics' Bldg., Boston Automobile Dealers' Assn.

Mar. 3-10—Washington, D. C., Middle Atlantic Motor Assn., Inc., Union Bldg.

Mar. 6-9—Fargo, N. D., A. Hanson, Mgr.

March 6-10—Ft. Dodge, Iowa, Northern Iowa Show, New Terminal Warehouse, G. W. Tremain, Secretary.

March 7-10—St. Joseph, Mo., Auditorium, St. Joseph Automobile Show Assn.

March 13-16 — Fargo, N. D., Armory and Auditorium.

March 14-17—Mason City, Ia., Armory, Mason City Automobile Dealers.

March 14-17—Davenport, Iowa, Show, Coliseum Bldg., Tri-City Auto. Trade.

Mar. 14-17—Trenton, N. J., J. L. Brock, Mgr.

March 17-22 — New Haven, Conn., Show, Hotel Taft.

Mar. 17-24—Pittsburgh, Pa., Motor Square Garden, J. J. Bell, Mgr.

March 18-23—Cedar Rapids, Ia., Cedar Rapids Automobile Trades Assn.

April—Calumet, Mich., Show, Coliseum, Frank Ketchell, Mgr.

Apr. 4-7—Stockton, Cal., Second Annual San Joaquin Auto Trades Assn., Samuel S. Cohn, Mgr.

Sept. 2-9—Spokane, Wash., Interstate Fair.